



SAR TEST REPORT

Applicant Huawei Technologies Co., Ltd
FCC ID QISATU-L11
Product Smart Phone
Model ATU-L11
Report No. R1802H0028-S1
Issue Date March 13, 2018

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **IEEE 1528-2013, ANSI/ IEEE C95.1-1992**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

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1 Test Laboratory

1.1 Notes of the Test Report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

1.2 Test facility

CNAS (accreditation number: L2264)

TA Technology (Shanghai) Co., Ltd. has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS).

FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

IC (recognition number is 8510A)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement.

VCCI (recognition number is C-4595, T-2154, R-4113, G-10766)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Japan to perform electromagnetic emission measurement.

A2LA (Certificate Number: 3857.01)

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

1.3 Testing Location

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1.4 Laboratory Environment

Temperature	Min. = 18°C, Max. = 25 °C
Relative humidity	Min. = 30%, Max. = 70%
Ground system resistance	< 0.5 Ω
Ambient noise is checked and found very low and in compliance with requirement of standards. Reflection of surrounding objects is minimized and in compliance with requirement of standards.	

2 Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for the EUT are as follows:

Table 2.1: Highest Reported SAR

Mode	Highest Reported SAR (W/kg)			
	1g SAR Head	1g SAR Body-worn (Separation 15mm)	1g SAR Hotspot (Separation 10mm)	Product Specific 10-g SAR (Separation 0mm)
GSM 850	0.29	0.36	0.35	/
GSM 1900	0.19	0.21	0.62	/
WCDMA Band II	0.43	0.35	0.75	/
WCDMA Band V	0.38	0.47	0.51	/
LTE FDD 5	0.30	0.30	0.36	/
LTE FDD 7	0.14	0.34	0.74	/
Wi-Fi (2.4G)	1.07	0.13	0.24	/
Bluetooth	0.18	/	/	/
Date of Testing:	February 26, 2018~ March 7, 2018			
Note: 1) The highest Reported SAR for head, body-worn, hotspot and simultaneous transmission exposure conditions are 1.07 W/kg, 0.47 W/kg, 0.75 W/kg and 1.131 W/kg. 2) For body worn operation, this device has been tested and meets FCC RF exposure guidelines when used with any accessory that contains no metal and that positions the handset a minimum of 15mm from the body. Use of other accessories may not ensure compliance with FCC RF exposure guidelines. The device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits according to the FCC rule § 2.1093, the ANSI C95.1: 1992/IEEE C95.1: 1991, and had been tested in accordance with the measurement methods and procedures specified in IEEE Std 1528-2013.				

3 Description of Equipment under Test

Client Information

Applicant	Huawei Technologies Co., Ltd.
Applicant address	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.China.
Manufacturer	Huawei Technologies Co., Ltd.
Manufacturer address	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.China.

General Technologies

Application Purpose:	Original Grant
EUT Stage	Identical Prototype
Model:	ATU-L11
IMEI:	867269030025954
Hardware Version:	HL1ATUM
Software Version:	ATU-L11 8.0.1.44(SP1C900)
Antenna Type:	Internal Antenna
Device Class:	B
Wi-Fi Hotspot	Wi-Fi 2.4G
Power Class:	GSM 850:4 GSM 1900:1 UMTS Band II/V:3 LTE FDD 5/7:3
Power Level	GSM 850:level 5 GSM 1900:level 0 UMTS Band II/V:all up bits LTE FDD 5/7:max power
EUT Accessory	
Adapter 1- EU	Manufacturer: SHENZHEN HUNTKEY ELECTRIC CO., LTD Model: HW-050100E01
Adapter 2- EU	Manufacturer: HUIZHOU BYD ELECTRONIC CO., LTD. Model: HW-050100E01
Adapter 3- EU	Manufacturer: DONG GUAN PHITEK ELECTRONICS CO., LTD. Model: HW-050100E01
Adapter 4- UK	Manufacturer: SHENZHEN HUNTKEY ELECTRIC CO., LTD



	Model: HW-050100B01
Adapter 5- UK	Manufacturer: HUIZHOU BYD ELECTRONIC CO., LTD. Model: HW-050100B01
Adapter 6- UK	Manufacturer: DONG GUAN PHITEK ELECTRONICS CO., LTD. Model: HW-050100B01
Adapter 7- US	Manufacturer: SHENZHEN HUNTKEY ELECTRIC CO., LTD Model: HW-050100U01
Adapter 8- US	Manufacturer: HUIZHOU BYD ELECTRONIC CO., LTD. Model: HW-050100U01
Adapter 9- US	Manufacturer: DONG GUAN PHITEK ELECTRONICS CO., LTD. Model: HW-050100U01
Adapter 10- AU	Manufacturer: SHENZHEN HUNTKEY ELECTRIC CO., LTD Model: HW-050100A01
Adapter 11- AU	Manufacturer: HUIZHOU BYD ELECTRONIC CO., LTD. Model: HW-050100A01
Adapter 12- AU	Manufacturer: DONG GUAN PHITEK ELECTRONICS CO., LTD. Model: HW-050100A01
Battery 1	Manufacturer: SCUD(FUJIAN) Electronics Co.,Ltd Model: HB366481ECW-11
Battery 2	Manufacturer: Sunwoda Electronics Co.,Ltd Model: HB366481ECW-11
Battery 3	Manufacturer: Desay battery Co.,LTD Model: HB366481ECW-11
Earphone 1	Manufacturer: BOLUO COUNTY QUANCHENG ELECTRONIC CO.,LTD Model: 1293-3283-3.5MM-300
Earphone 2	Manufacturer: GoerTek Inc Model: HA1-3W
Earphone 3	Manufacturer: Jiangxi Lianchuang Hongsheng Electronic Co.,LTD Model: MEMD1532B528A00
Earphone 4	Manufacturer: BOLUO COUNTY QUANCHENG ELECTRONIC CO.,LTD Model: 1293#+3283# 3.5MM-150
Earphone 5	Manufacturer: GoerTek Inc Model: HA1-3
Earphone 6	Manufacturer: Jiangxi Lianchuang Hongsheng Electronic Co.,LTD Model: MEMD1532B528000
Earphone 7	Manufacturer: FOXCONN Model: EPAB542-2WH03-DH
USB Extend Cable	100cm Cable, Shielded

Wireless Technology and Frequency Range

Wireless Technology		Modulation	Operating mode	Tx (MHz)
GSM	850	Voice(GMSK) GPRS(GMSK)	☐ Multi-slot Class:8-1UP ☐ Multi-slot Class:10-2UP	824 ~ 849
	1900	EGPRS(GMSK,8PSK)	☒ Multi-slot Class:12-4UP ☐ Multi-slot Class:33-4UP	1850 ~ 1910
	Does this device support DTM (Dual Transfer Mode)? ☐ Yes ☒ No			
UMTS	Band II	QPSK	HSDPA UE Category:14 HSUPA UE Category:6	1850 ~ 1910
	Band V		DC-HSDPA UE Category:24	824 ~ 849
LTE	FDD 5	QPSK, 16QAM	Rel. 9	824 ~ 849
	FDD 7			2500 ~ 2570
	Does this device support Carrier Aggregation (CA) ☐ Yes ☒ No			
	Does this device support SV-LTE (1xRTT-LTE)? ☐ Yes ☒ No			
BT	2.4G	Version 4.2 LE		2402 ~2480
Wi-Fi	2.4G	DSSS,OFDM	802.11b/g/n HT20	2412 ~ 2462
		OFDM	802.11n HT40	2422 ~ 2452
	Does this device support MIMO ☐ Yes ☒ No			
NFC	13.56MHz			



4 Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE 1528- 2013, ANSI C95.1: 1992/IEEE C95.1: 1991, the following FCC Published RF exposure KDB procedures:

248227 D01 802.11 Wi-Fi SAR v02r02
447498 D01 General RF Exposure Guidance v06
648474 D04 Handset SAR v01r03
865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
865664 D02 RF Exposure Reporting v01r02
941225 D01 3G SAR Procedures v03r01
941225 D05 SAR for LTE Devices v02r05
941225 D06 Hotspot Mode v02r01

5 Operational Conditions during Test

5.1 Test Positions

5.1.1 Against Phantom Head

Measurements were made in “cheek” and “tilt” positions on both the left hand and right hand sides of the phantom.

The positions used in the measurements were according to IEEE 1528 - 2013 "IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques".

5.1.2 Body Worn Configuration

Body-worn operating configurations should be tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in normal use configurations.

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration. Per FCC KDB Publication 648474 D04, Body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in FCC KDB Publication 447498 D01 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is $> 1.2 \text{ W/kg}$, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

Accessories for Body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then multiple accessories that contain metallic components are tested with the device with each accessory. If multiple accessories share an identical metallic component (i.e. the same metallic belt-clip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.

Body-worn accessories may not always be supplied or available as options for some devices intended to be authorized for body-worn use. In this case, a test configuration with a separation distance between the back of the device and the flat phantom is used. Test position spacing was documented. Transmitters that are designed to operate in front of a person's face, as in push-to-talk configurations, are tested for SAR compliance with the front of the device positioned to face the flat phantom in head fluid. For devices that are carried next to the body such as a shoulder, waist or chest-worn transmitters, SAR compliance is tested with the accessories, including headsets and microphones, attached to the device and positioned against a flat phantom in a normal use configuration.

5.1.3 Phablet SAR test considerations

For smart phones, with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm, that can provide similar mobile web access and multimedia support found in mini-tablets or UMPC mini-tablets and support voice calls next to the ear, unless it is confirmed otherwise through KDB inquiries, the following phablet procedures should be applied to evaluate SAR compliance for each applicable wireless modes and frequency band. Devices marketed as phablets, regardless of form factors and operating characteristics must be tested as a phablet to determine SAR compliance.

- a) The normally required head and body-worn accessory SAR test procedures for handsets, including hotspot mode, must be applied.
- b) The UMPC mini-tablet procedures must also be applied to test the SAR of all surfaces and edges with an antenna located at ≤ 25 mm from that surface or edge, in direct contact with a flat phantom, for product specific 10-g SAR according to the body-equivalent tissue dielectric parameters in KDB Publication 865664 D01 to address interactive hand use exposure conditions. The 1-g SAR at 5 mm for UMPC mini-tablets is not required. When hotspot mode applies, 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg; however, when power reduction applies to hotspot mode the measured SAR must be scaled to the maximum output power, including tolerance, allowed for phablet modes to compare with the 1.2 W/kg SAR test reduction threshold. The normal tablet procedures in KDB Publication 616217 are required when the overall diagonal dimension of the device is > 20.0 cm. Hotspot mode SAR is not required when normal tablet procedures are applied. Extremity 10-g SAR is also not required for the front (top) surface of larger form factor full size tablets. The more conservative normal tablet SAR results can be used to support phablet mode 10-g extremity SAR.
- c) The simultaneous transmission operating configurations applicable to voice and data transmissions for both phone and mini-tablet modes must be taken into consideration separately for 1-g and 10-g SAR to determine the simultaneous transmission SAR test exclusion and measurement requirements for the relevant wireless modes and exposure conditions.

5.2 Measurement Variability

Per FCC KDB Publication 865664 D01, SAR measurement variability was assessed for each frequency band, which was determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media were required for SAR measurements in a frequency band, the variability measurement procedures were applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. These additional measurements were repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device was returned to ambient conditions (normal room temperature) with the battery fully charged before it was re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

SAR Measurement Variability was assessed using the following procedures for each frequency band:

- 1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.
- 2) A second repeated measurement was performed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg ($\sim 10\%$ from the 1-g SAR limit).
- 3) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20 .
- 4) Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg

The same procedures should be adapted for measurements according to extremity and occupational exposure limits by applying a factor of 2.5 for extremity exposure and a factor of 5 for occupational exposure to the corresponding SAR thresholds.

5.3 Test Configuration

5.3.1 GSM Test Configuration

According to specification 3GPP TS 51.010, the maximum power of the GSM can do the power reduction for the multi-slot. The allowed power reduction in the multi-slot configuration is as following:

Output power of reductions:

Table 5.1: The allowed power reduction in the multi-slot configuration

Number of timeslots in uplink assignment	Permissible nominal reduction of maximum output power,(dB)
1	0
2	0 to 3,0
3	1,8 to 4,8
4	3,0 to 6,0

5.3.2 3G Test Configuration

3G SAR Test Reduction Procedure

In the following procedures, the mode tested for SAR is referred to as the primary mode. The equivalent modes considered for SAR test reduction are denoted as secondary modes. Both primary and secondary modes must be in the same frequency band. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is $\leq \frac{1}{4}$ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode.³ This is referred to as the 3G SAR test reduction procedure in the following SAR test guidance, where the primary mode is identified in the applicable wireless mode test procedures and the secondary mode is wireless mode being considered for SAR test reduction by that procedure. When the 3G SAR test reduction procedure is not satisfied, it is identified as “otherwise” in the applicable procedures; SAR measurement is required for the secondary mode.

5.3.2.1 WCDMA Test Configuration

Output power Verification

Maximum output power is verified on the high, middle and low channels according to procedures described in section 5.2 of 3GPP TS 34.121, using the appropriate RMC or AMR with TPC (transmit power control) set to all “1’s” for WCDMA/HSDPA or by applying the required inner loop power control procedures to maintain maximum output power while HSUPA is active. Results for all applicable physical channel configurations (DPCCH, DPDCHn and spreading codes, HSDPA, HSPA) are required in the SAR report. All configurations that are not supported by the handset or cannot be measured due to technical or equipment limitations must be clearly identified.

Head SAR

SAR for next to the ear head exposure is measured using a 12.2 kbps RMC with TPC bits configured to all “1’s”. The 3G SAR test reduction procedure is applied to AMR configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for 12.2 kbps AMR in 3.4 kbps SRB (signaling radio bearer) using the highest reported SAR configuration in 12.2 kbps RMC for head exposure.

Body-Worn Accessory SAR

SAR for body-worn accessory configurations is measured using a 12.2 kbps RMC with TPC bits configured to all “1’s”. The 3G SAR test reduction procedure is applied to other spreading codes and multiple DPDCHn configurations supported by the handset with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured using an applicable RMC configuration with the corresponding spreading code or DPDCHn, for the highest reported body-worn accessory exposure SAR configuration in 12.2 kbps RMC. When more than 2 DPDCHn are supported by the handset, it may be necessary to configure additional DPDCHn using FTM (Factory Test Mode) or other chipset based test approaches with parameters similar to those used in 384 kbps and 768 kbps RMC.

Handsets with Release 5 HSDPA

The 3G SAR test reduction procedure is applied to HSDPA body-worn accessory configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for HSDPA using the HSDPA body SAR procedures in the “Release 5 HSDPA Data Devices” section of this document, for the highest reported SAR body-worn accessory exposure configuration in 12.2 kbps RMC. Handsets with both HSDPA and HSUPA are tested according to Release 6 HSPA test procedures.

HSDPA should be configured according to the UE category of a test device. The number of HSDSCH/ HS-PDSCHs, HARQ processes, minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the H-set. To maintain a consistent test configuration and stable transmission conditions, QPSK is used in the H-set for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 4 ms with a CQI repetition factor of 2 to maintain a constant rate of active CQI slots. DPCCH and DPDCH gain factors (β_c , β_d), and HS-DPCCH power offset parameters (Δ_{ACK} , Δ_{NACK} , Δ_{CQI}) should be set according to values indicated in the Table below. The CQI value is determined by the UE category, transport block size, number of HS-PDSCHs and modulation used in the H-set.

Table 5.2: Subtests for UMTS Release 5 HSDPA

Sub-set	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (note 1, note 2)	CM(dB) (note 3)	MPR(dB)
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 (note 4)	15/15 (note 4)	64	12/15 (note 4)	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note1: Δ_{ACK} , Δ_{NACK} and $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$
Note2: CM=1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$.
Note3: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TFC1, TF1) to $\beta_c = 11/15$ and $\beta_d = 15/15$.

HSUPA Test Configuration

The 3G SAR test reduction procedure is applied to HSPA (HSUPA/HSDPA with RMC) body-worn accessory configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for HSPA using the HSPA body SAR procedures in the “Release 6 HSPA Data Devices” section of this document, for the highest reported body-worn accessory exposure SAR configuration in 12.2 kbps RMC. When VOIP is applicable for next to the ear head exposure in HSPA, the 3G SAR test reduction procedure is applied to HSPA with 12.2 kbps RMC as the primary mode; otherwise, the same HSPA configuration used for body-worn accessory measurements is tested for next to the ear head exposure.

Due to inner loop power control requirements in HSPA, a communication test set is required for output power and SAR tests. The 12.2 kbps RMC, FRC H-set 1 and E-DCH configurations for HSPA are configured according to the β values indicated in Table 2 and other applicable procedures described in the ‘WCDMA Handset’ and ‘Release 5 HSDPA Data Devices’ sections of this document

Table 5.3: Sub-Test 5 Setup for Release 6 HSUPA

Sub-set	β_c	β_d	β_d (SF)	β_c/β_d	$\beta_{hs}^{(1)}$	β_{ec}	β_{ed}	β_{ed} (SF)	β_{ed} (codes)	CM ⁽²⁾ (dB)	MPR (dB)	AG ⁽⁴⁾ Index	E-TFCI
1	11/15 ⁽³⁾	15/15 ⁽³⁾	64	11/15 ⁽³⁾	22/15	209/225	1039/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed1} 47/15 β_{ed2} 47/15	4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15 ⁽⁴⁾	15/15 ⁽⁴⁾	64	15/15 ⁽⁴⁾	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK} , Δ_{NACK} and $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$.

Note 2: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.

Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 10/15$ and $\beta_d = 15/15$.

Note 4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 14/15$ and $\beta_d = 15/15$.

Note 5: Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Figure 5.1g.

Note 6: β_{ed} can not be set directly; it is set by Absolute Grant Value.

Table 5.4: HSUPA UE category

UE E-DCH Category	Maximum E-DCH Codes Transmitted	Number of HARQ Processes	E- DCH TTI (ms)	Minimum Spreading Factor	Maximum E-DCH Transport Block Bits	Max Rate (Mbps)
1	1	4	10	4	7110	0.7296
2	2	8	2	4	2798	1.4592
	2	4	10	4	14484	
3	2	4	10	4	14484	1.4592
4	2	8	2	2	5772	2.9185
	2	4	10	2	20000	2.00
5	2	4	10	2	20000	2.00
6 (No DPDCH)	4	8	2	2 SF2 & 2 SF4	11484	5.76
	4	4	10		20000	2.00
7 (No DPDCH)	4	8	2	2 SF2 & 2 SF4	22996	?
	4	4	10		20000	?

NOTE: When 4 codes are transmitted in parallel, two codes shall be transmitted with SF2 and two with SF4.
UE Categories 1 to 6 supports QPSK only. UE Category 7 supports QPSK and 16QAM.
(TS25.306-7.3.0)

HSPA, HSPA+ and DC-HSDPA Test Configuration

Measurement is required for HSPA, HSPA+ or DC-HSDPA, a KDB inquiry is required to confirm that the wireless mode configurations in the test setup have remained stable throughout the SAR measurements.³⁵ Without prior KDB confirmation to determine the SAR results are acceptable, a PBA is required for TCB approval.

SAR test exclusion for HSPA, HSPA+ and DC-HSDPA is determined according to the following:

1) The HSPA procedures are applied to configure 3GPP Rel. 6 HSPA devices in the required sub-test mode(s) to determine SAR test exclusion.

2) SAR is required for Rel. 7 HSPA+ when SAR is required for Rel. 6 HSPA; otherwise, the 3G SAR test reduction procedure is applied to (uplink) HSPA+ with 12.2 kbps RMC as the primary mode.³⁶ Power is measured for HSPA+ that supports uplink 16 QAM according to configurations in Table C.11.1.4 of 3GPP TS 34.121-1 to determine SAR test reduction.

3) SAR is required for Rel. 8 DC-HSDPA when SAR is required for Rel. 5 HSDPA; otherwise, the 3G SAR test reduction procedure is applied to DC-HSDPA with 12.2 kbps RMC as the primary mode. Power is measured for DC-HSDPA according to the H-Set 12, FRC configuration in Table C.8.1.12 of 3GPP TS 34.121-1 to determine SAR test reduction. A primary and a secondary serving HS-DSCH Cell are required to perform the power measurement and for the results to be acceptable.

4) Regardless of whether a PBA is required, the following information must be verified and included in the SAR report for devices supporting HSPA, HSPA+ or DC-HSDPA: a) The output power measurement results and applicable release version(s) of 3GPP TS 34.121.

i) Power measurement difficulties due to test equipment setup or availability must be resolved between the grantee and its test lab.

b) The power measurement results are in agreement with the individual device implementation and specifications. When Enhanced MPR (E-MPR) applies, the normal MPR targets may be modified according to the Cubic Metric (CM) measured by the device, which must be taken into consideration.

c) The UE category, operating parameters, such as the β and Δ values used to configure the device for testing, power setback procedures described in 3GPP TS 34.121 for the power measurements, and HSPA/HSPA+ channel conditions (active and stable) for the entire duration of the measurement according to the required E-TFCI and AG index values.

5) When SAR measurement is required, the test configurations, procedures and power measurement results must be clearly described to confirm that the required test parameters are used, including E-TFCI and AG index stability and output power conditions.

Table 5.5: HS-DSCH UE category
Table 5.1a: FDD HS-DSCH physical layer categories

HS-DSCH category	Maximum number of HS-DSCH codes received	Minimum inter-TTI interval	Maximum number of bits of an HS-DSCH transport block received within an HS-DSCH TTI NOTE 1	Total number of soft channel bits	Supported modulations without MIMO operation or dual cell operation	Supported modulations with MIMO operation and without dual cell operation	Supported modulations with dual cell operation
Category 1	5	3	7298	19200	QPSK, 16QAM	Not applicable (MIMO not supported)	Not applicable (dual cell operation not supported)
Category 2	5	3	7298	28800			
Category 3	5	2	7298	28800			
Category 4	5	2	7298	38400			
Category 5	5	1	7298	57600			
Category 6	5	1	7298	67200			
Category 7	10	1	14411	115200			
Category 8	10	1	14411	134400			
Category 9	15	1	20251	172800			
Category 10	15	1	27952	172800			
Category 11	5	2	3630	14400	QPSK		
Category 12	5	1	3630	28800			
Category 13	15	1	35280	259200	QPSK, 16QAM, 64QAM		
Category 14	15	1	42192	259200			
Category 15	15	1	23370	345600	QPSK, 16QAM		
Category 16	15	1	27952	345600	QPSK, 16QAM		
Category 17 NOTE 2	15	1	35280	259200	QPSK, 16QAM, 64QAM	–	
			23370	345600	–	QPSK, 16QAM	
Category 18 NOTE 3	15	1	42192	259200	QPSK, 16QAM, 64QAM	–	
			27952	345600	–	QPSK, 16QAM	
Category 19	15	1	35280	518400	QPSK, 16QAM, 64QAM		
Category 20	15	1	42192	518400	QPSK, 16QAM, 64QAM		
Category 21	15	1	23370	345600	-	-	QPSK, 16QAM
Category 22	15	1	27952	345600			QPSK, 16QAM, 64QAM
Category 23	15	1	35280	518400			
Category 24	15	1	42192	518400			

5.3.3 LTE Test Configuration

LTE modes were tested according to FCC KDB 941225 D05 publication. Please see notes after the tabulated SAR data for required test configurations. Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. The R&S CMW500 was used for LTE output power measurements and SAR testing. Max power control was used so the UE transmits with maximum output power during SAR testing. SAR must be measured with the maximum TTI (transmit time interval) supported by the device in each LTE configuration.

A) Spectrum Plots for RB Configurations

A properly configured base station simulator was used for SAR tests and power measurements. Therefore, spectrum plots for RB configurations were not required to be included in this report.

B) MPR

MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.

C) A-MPR

A-MPR (Additional MPR) has been disabled for all SAR tests by setting NS=01 on the base station simulator.

D) Largest channel bandwidth standalone SAR test requirements**1) QPSK with 1 RB allocation**

Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required for 1 RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel. When the reported SAR of a required test channel is > 1.45 W/kg, SAR is required for all three RB offset configurations for that required test channel.

2) QPSK with 50% RB allocation

The procedures required for 1 RB allocation in 1) are applied to measure the SAR for QPSK with 50% RB allocation.

3) QPSK with 100% RB allocation

For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation in 1) and 2) are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.

4) Higher order modulations

For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK procedures in above sections to determine the QAM configurations that may need SAR measurement. For each configuration identified as required for testing, SAR is required only when the highest maximum output power for the configuration in the higher order modulation is $> \frac{1}{2}$ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg.

E) Other channel bandwidth standalone SAR test requirements

For the other channel bandwidths used by the device in a frequency band, apply all the procedures required for the largest channel bandwidth in section A) to determine the channels and RB configurations that need SAR testing and only measure SAR when the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is $> \frac{1}{2}$ dB higher than the equivalent channel configurations in the largest channel bandwidth configuration or the *reported* SAR of a configuration for the largest channel bandwidth is > 1.45 W/kg.

5.3.4 Wi-Fi Test Configuration

SAR test reduction for 802.11 Wi-Fi transmission mode configurations are considered separately for DSSS and OFDM. An initial test position is determined to reduce the number of tests required for certain exposure configurations with multiple test positions. An initial test configuration is determined for each frequency band and aggregated band according to maximum output power, channel bandwidth, wireless mode configurations and other operating parameters to streamline the measurement requirements. For 2.4 GHz DSSS, either the initial test position or DSSS procedure is applied to reduce the number of SAR tests; these are mutually exclusive. For OFDM, an initial test position is only applicable to next to the ear, UMPC mini-tablet and hotspot mode configurations, which is tested using the initial test configuration to facilitate test reduction. For other exposure conditions with a fixed test position, SAR test reduction is determined using only the initial test configuration.

The multiple test positions require SAR measurements in head, hotspot mode or UMPC mini-tablet configurations may be reduced according to the highest reported SAR determined using the *initial test position(s)* by applying the DSSS or OFDM SAR measurement procedures in the required wireless mode test configuration(s). The *initial test position(s)* is measured using the highest measured maximum output power channel in the required wireless mode test configuration(s). When the *reported SAR* for the *initial test position* is:

- ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and wireless mode combination within the frequency band or aggregated band. DSSS and OFDM configurations are considered separately according to the required SAR procedures.
- 0.4 W/kg, SAR is repeated using the same wireless mode test configuration tested in the *initial test position* to measure the subsequent next closet/smallest test separation distance and maximum coupling test position, on the highest maximum output power channel, until the *reported SAR* is ≤ 0.8 W/kg or all required test positions are tested.
 - ✧ For subsequent test positions with equivalent test separation distance or when exposure is dominated by coupling conditions, the position for maximum coupling condition should be tested.
 - ✧ When it is unclear, all equivalent conditions must be tested.
- For all positions/configurations tested using the *initial test position* and subsequent test positions, when the *reported SAR* is > 0.8 W/kg, measure the SAR for these positions/configurations on the subsequent next highest measured output power channel(s) until the *reported SAR* is ≤ 1.2 W/kg or all required test channels are considered.
 - ✧ The additional power measurements required for this step should be limited to those necessary for identifying subsequent highest output power channels to apply the test reduction.

To determine the initial test position, Area Scans were performed to determine the position with the Maximum Value of SAR (measured). The position that produced the highest Maximum Value of SAR is considered the worst case position; thus used as the initial test position.

A Wi-Fi device must be configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools for SAR measurement.

5.3.5 BT Test Configuration

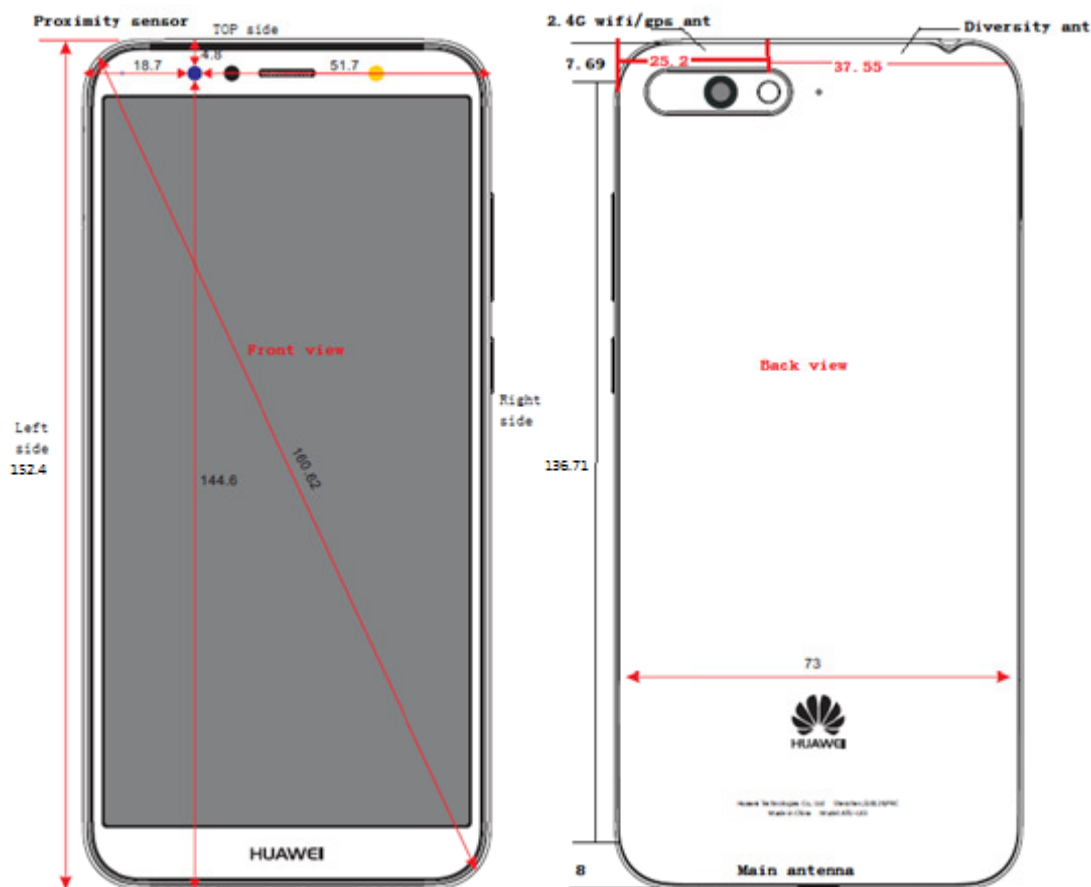
For BT SAR testing, BT engineering testing software installed on the EUT can provide continuous transmitting RF signal with maximum output power. And the CBT control the EUT operating with hopping off and data rate set for DH5.

5.1.1 IR Proximity sensor configuration

This device uses an infrared proximity sensor to facilitate triggering in typical user interactivity with the device.

Due to the operating configurations and exposure conditions required by the device, the proximity sensor is used to indicate when the phone is held close to a user's ear exposure condition or when the phone is used in body front side scenario exposure condition. It utilizes the proximity sensor to reduce the output power of Wi-Fi antenna when Wi-Fi and 2G&3G&4G main antenna voice mode transmit simultaneously in held-to-ear scenario or body front side scenario.

1) Antennas and sensor placement details

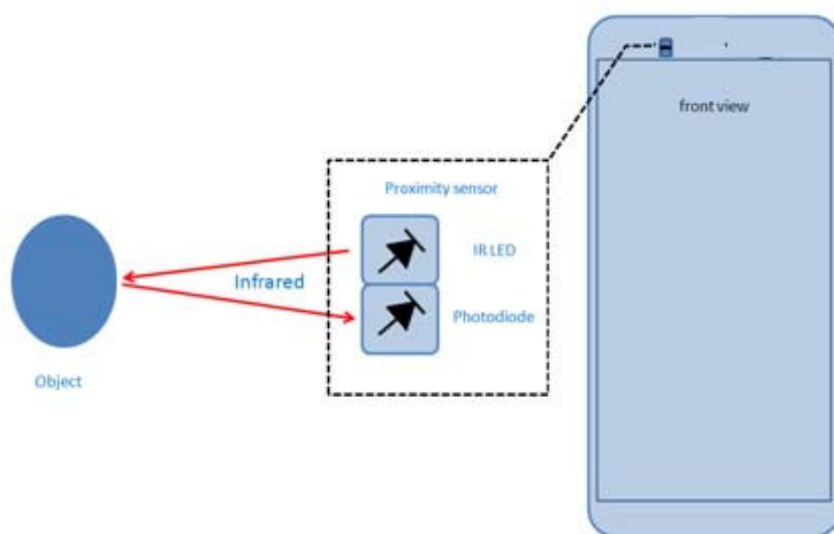


The location of the antennas and the IR proximity sensor

Note: The device has one GSM&UMTS<E main antenna and one WiFi 2.4G/BT antenna.

Antenna and sensor distances (front view, unit: mm)						
Antenna	Front side	Back side	Left side	Right side	Top side	Bottom side
Main Antenna	0	0	0	0	152.4	0
2.4G WiFi Antenna	0	0	37.55	0	0	152.4
IR Proximity Sensor	0	0	18.7	51.7	4.8	144.6
The IR proximity sensor locates on the front face of the device and detects objects approaching only from the front side						

2) Proximity sensor clarifications

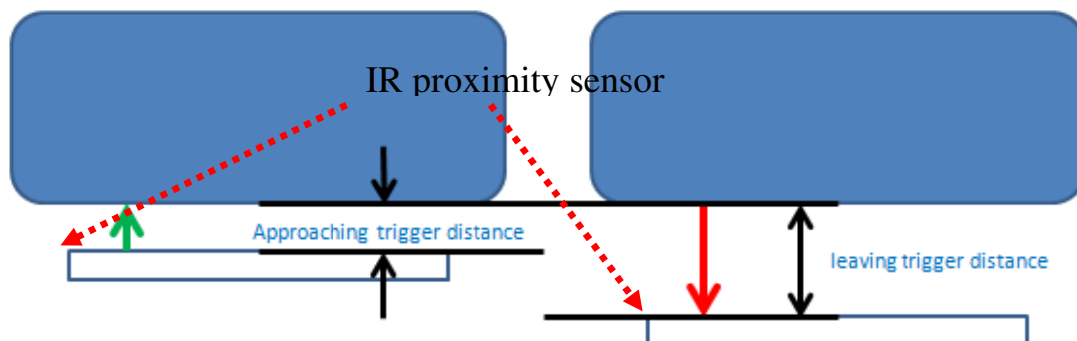


The picture of the proximity sensor

3) Proximity sensor coverage, distance and angle

a) Procedures for determining proximity sensor triggering distances

As the proximity sensor locates on the front face of the device and detects objects approaching only from the front side, so triggering distance only need to be checked for the front side of Wi-Fi band when Wi-Fi and 2G&3G&4G main antenna voice mode transmit simultaneously.



Proximity sensor triggering distances assessment (Front side)

The DUT is moved towards from the flat phantom:

Distance between phantom to DUT in mm	45	40	35	30	25	20	15
Condition of Sensor in the front side of the device(under voice mode)	off	off	off	off	off	on	on

The DUT is moved away from the flat phantom:

Distance between phantom to DUT in mm	75	70	65	60	55	50	45
Condition of Sensor in the front side of the device(under voice mode)	off	off	off	off	off	on	on

Conclusion: The Proximity sensor triggering distance is N mm (about 20-50 mm), so it can be ensured that the proximity sensor Power reduction is valid for the Head and body front side exposure condition.

b) Procedures for determining antenna and proximity sensor coverage

As the proximity sensor locates on the front face of the device and detects objects approaching only from the front side, so triggering distance only need to be checked for the front side of Wi-Fi band when Wi-Fi and 2G&3G&4G main antenna voice mode transmit simultaneously.

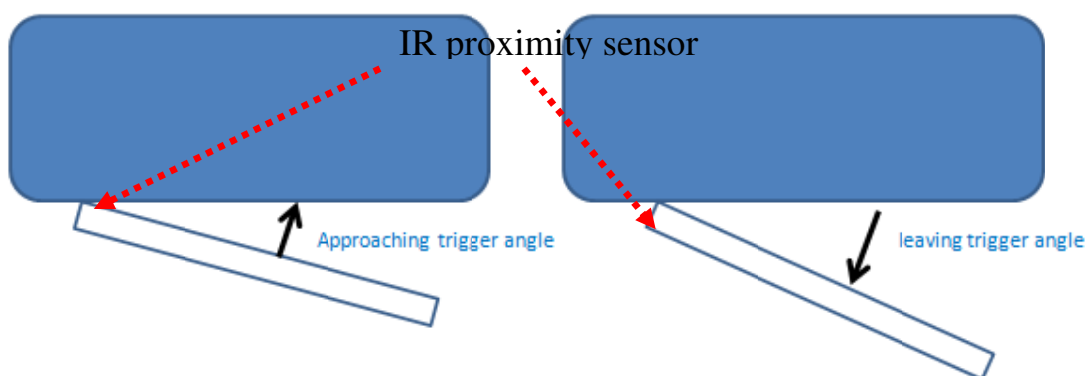
c) Procedures for determining device tilt angle influences to proximity sensor triggering

The following procedure is used to determine the triggering angle. Distance need to be check when device under voice mode so that sensor is working.

- 1) For Body exposure condition, as the proximity sensor triggering power reduction is only applicable for the front side, so tilt angle influences for the other edges does not need to be assessed.
- 2) For Head exposure condition, device tilt angle influences to proximity sensor triggering is determined as below:

Firstly, the DUT was positioned directly touch the SAM phantom (Left&Right hand touch cheek position) for each band. Rotate the DUT around the ear reference point of the phantom in 5° increments until the DUT is 15° or more away from the touch cheek position at 0°

Then the DUT is positioned at 15° or more away from the touch cheek position and moved towards the phantom in 5° increments until the DUT directly touch the SAM phantom at 0°(Left & Right hand touch cheek position).



The DUT is moved towards and away from SAM phantom.

angle between phantom to DUT in degree	0	5	10	15	20	25	30
Condition of Sensor	on	on	on	on	on	on	on

Based on the validation results above, angle tilt coverage can ensure that the proximity sensor is triggered for all the Head test positions(Left/Right Hand Touched cheek, Left/Right Hand tilted 15 °)

4) Summary SAR test Plan for Proximity sensor power reduction

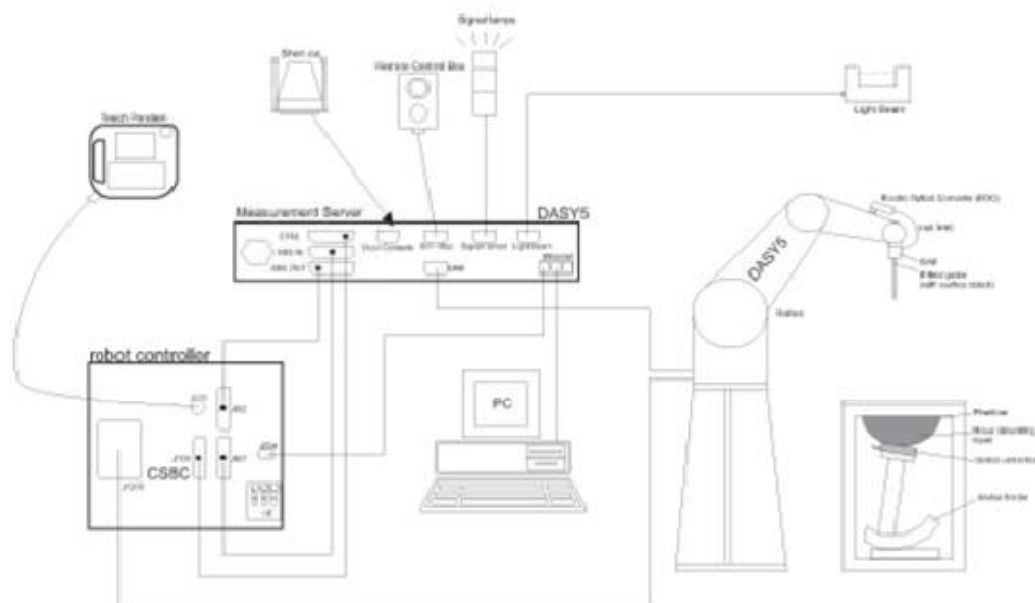
To sum up, as the device uses proximity sensor triggering power reduction when Wi-Fi antenna transmits simultaneously with main antenna(Voice mode) in held-to-ear scenarios or body front face scenario, therefore:

- a) For Head SAR compliance: The standalone SAR compliance still uses the standalone SAR results tested at the maximum output power level without any power reduction. Additional Head SAR for Wi-Fi antenna is evaluated at reduced power levels when 2G&3G&4G antenna in voice mode and Wi-Fi antennas transmit simultaneously.
- b) For Body SAR compliance, the standalone SAR compliance still uses the standalone SAR results tested at the maximum output power level without any power reduction.

6 SAR Measurements System Configuration

6.1 SAR Measurement Set-up

The DASY system for performing compliance tests consists of the following items:



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

6.2 DASY5 E-field Probe System

The SAR measurements were conducted with the dosimetric probe EX3DV4 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation.

EX3DV4 Probe Specification

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025 calibration service available
Frequency	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 μ W/g to > 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 μ W/g)
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Application	High precision dosimetric measurements in any exposure Scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.



E-field Probe Calibration

Each probe is calibrated according to a dosimetric assessment procedure with accuracy better than $\pm 10\%$. The spherical isotropy was evaluated and found to be better than ± 0.25 dB. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested.

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies below 1 GHz, and in a wave guide above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees.

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The measured free space E-field in the medium correlates to temperature rise in a dielectric medium. For temperature correlation calibration a RF transparent thermistor-based

temperature probe is used in conjunction with the E-field probe.

$$SAR = C \Delta T / \Delta t$$

Where: Δt = Exposure time (30 seconds),

C = Heat capacity of tissue (brain or muscle),

ΔT = Temperature increase due to RF exposure.

Or

$$SAR = IEI^2 \sigma / \rho$$

Where: σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m^3).

6.3 SAR Measurement Procedure

Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

Area Scan

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.

Area scan parameters extracted from FCC KDB 865664 D01 SAR measurement 100 MHz to 6 GHz.

	≤3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5 \text{ mm}$
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: $\Delta x_{\text{Area}}, \Delta y_{\text{Area}}$	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

Zoom Scan

Zoom scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 gram and 10 gram of simulated tissue. The zoom scan measures points (refer to table below) within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the zoom scan evaluates the averaged SAR for 1 gram and 10 gram and displays these values next to the job's label.

Zoom scan parameters extracted from FCC KDB 865664 D01 SAR measurement 100 MHz to 6 GHz.

			≤3GHz	> 3 GHz
Maximum zoom scan spatial resolution: Δx_{zoom} Δy_{zoom}			≤2GHz: ≤8mm 2 – 3GHz: ≤5mm*	3 – 4GHz: ≤5mm* 4 – 6GHz: ≤4mm*
Maximum zoom scan spatial resolution, normal to phantom surface	Uniform grid: $\Delta z_{\text{zoom}}(n)$		≤5mm	3 – 4GHz: ≤4mm 4 – 5GHz: ≤3mm 5 – 6GHz: ≤2mm
	Graded grid	$\Delta z_{\text{zoom}}(1)$: between 1 st two points closest to phantom surface	≤4mm	3 – 4GHz: ≤3mm 4 – 5GHz: ≤2.5mm 5 – 6GHz: ≤2mm
		$\Delta z_{\text{zoom}}(n>1)$: between subsequent points	≤1.5• $\Delta z_{\text{zoom}}(n-1)$	
Minimum zoom scan volume	X, y, z		≥30mm	3 – 4GHz: ≥28mm 4 – 5GHz: ≥25mm 5 – 6GHz: ≥22mm
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.				
* When zoom scan is required and the <u>reported</u> SAR from the <i>area scan based 1-g SAR estimation</i> procedures of KDB 447498 is ≤ 1.4W/kg, ≤8mm, ≤7mm and ≤5mm zoom scan resolution may be applied, respectively, for 2GHz to 3GHz, 3GHz to 4GHz and 4GHz to 6GHz.				

Volume Scan Procedures

The volume scan is used to assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASY measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drifts more than 5%, the SAR will be retested.

7 Main Test Equipment

Name of Equipment	Manufacturer	Type/Model	Serial Number	Last Cal.	Cal. Due Date
Network analyzer	Agilent	E5071B	MY42404014	2017-05-20	2018-05-19
Dielectric Probe Kit	HP	85070E	US44020115	2017-05-20	2018-05-19
Power meter	Agilent	E4417A	GB41291714	2017-05-21	2018-05-20
Power sensor	Agilent	N8481H	MY50350004	2017-05-21	2018-05-20
Power sensor	Agilent	E9327A	US40441622	2017-05-20	2018-05-19
Dual directional coupler	Agilent	778D-012	50519	2017-05-21	2018-05-20
Dual directional coupler	Agilent	777D	50146	2017-05-20	2018-05-19
Amplifier	INDEXSAR	IXA-020	0401	2017-05-20	2018-05-19
Wideband radio communication tester	R&S	CMW 500	113645	2017-05-20	2018-05-19
BT Base Station Simulator	R&S	CBT	100271	2017-05-14	2018-05-13
E-field Probe	SPEAG	EX3DV4	3898	2017-06-27	2018-06-26
DAE	SPEAG	DAE4	1291	2017-10-31	2018-10-30
Validation Kit 835MHz	SPEAG	D835V2	4d020	2017-08-28	2020-08-27
Validation Kit 1900MHz	SPEAG	D1900V2	5d060	2017-08-26	2020-08-25
Validation Kit 2450MHz	SPEAG	D2450V2	786	2017-08-29	2020-08-28
Validation Kit 2600MHz	SPEAG	D2600V2	1058	2017-06-27	2020-06-26
Temperature Probe	Tianjin jinming	JM222	AA1009129	2017-05-17	2018-05-16
Hygrothermograph	Anymetr	NT-311	20150731	2017-05-17	2018-05-16
Software for Test	Speag	DASY5	52.8.8.1222	/	/
Software for Tissue	Agilent	85070	E06.01.36	/	/

8 Tissue Dielectric Parameter Measurements & System Verification

8.1 Tissue Verification

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within $\pm 2^\circ\text{C}$ of the temperature when the tissue parameters are characterized. The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance.

Target values

Frequency (MHz)		Water (%)	Salt (%)	Sugar (%)	Glycol (%)	Preventol (%)	Cellulose (%)	ϵ_r	$\sigma(\text{s/m})$
Head	835	41.45	1.45	56	0	0.1	1.0	41.5	0.90
	1900	55.242	0.306	0	44.452	0	0	40.0	1.40
	2450	62.7	0.5	0	36.8	0	0	39.2	1.80
	2600	55.242	0.306	0	44.452	0	0	39.0	1.96
Body	835	52.5	1.4	45	0	0.1	1.0	55.2	0.97
	1900	69.91	0.13	0	29.96	0	0	53.3	1.52
	2450	73.2	0.1	0	26.7	0	0	52.7	1.95
	2600	72.6	0.1	0	27.3	0	0	52.5	2.16

Measurements results

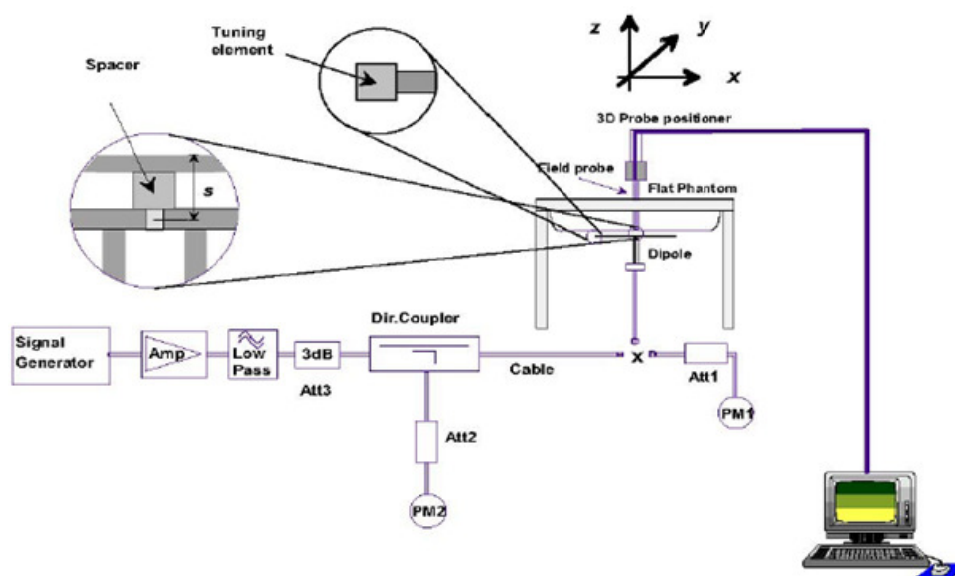
Frequency (MHz)		Test Date	Temp $^\circ\text{C}$	Measured Dielectric Parameters		Target Dielectric Parameters		Limit (Within $\pm 5\%$)	
				ϵ_r	$\sigma(\text{s/m})$	ϵ_r	$\sigma(\text{s/m})$	Dev $\epsilon_r(\%)$	Dev $\sigma(\%)$
835	Head	2/26/2018	21.5	41.4	0.88	41.5	0.90	-0.24	-2.22
	Body	2/27/2018	21.5	54.2	0.96	55.2	0.97	-1.81	-1.03
1900	Head	2/26/2018	21.5	40.1	1.41	40.0	1.40	0.25	0.71
	Body	2/29/2018	21.5	52.6	1.51	53.3	1.52	-1.31	-0.66
2450	Head	3/7/2018	21.5	38.6	1.81	39.2	1.80	-1.53	0.56
	Body	3/5/2018	21.5	52.5	1.98	52.7	1.95	-0.38	1.54
2600	Head	2/28/2018	21.5	38.2	2.01	39.0	1.96	-2.05	2.55
	Body	2/28/2018	21.5	51.5	2.23	52.5	2.16	-1.90	3.24

Note: The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 cm for measurements > 3 GHz.

8.2 System Performance Check

The manufacturer calibrates the probes annually. Dielectric parameters of the tissue simulates were measured using the dielectric probe kit and the network analyzer. A system check measurement for every day was made following the determination of the dielectric parameters of the Tissue simulates, using the dipole validation kit. The dipole antenna was placed under the flat section of the twin SAM phantom.

System check is performed regularly on all frequency bands where tests are performed with the DASY system.



Picture 1 System Performance Check setup



Picture 2 Setup Photo

System Check results

Frequency (MHz)		Test Date	Temp °C	250mW Measured SAR _{1g} (W/kg)	1W Normalized SAR _{1g} (W/kg)	1W Target SAR _{1g} (W/kg)	Δ % (Limit ±10%)	Plot No.
835	Head	2/26/2018	21.5	2.44	9.76	9.45	3.28	1
	Body	2/27/2018	21.5	2.41	9.64	9.75	-1.13	2
1900	Head	2/26/2018	21.5	9.88	39.52	40.10	-1.45	3
	Body	2/29/2018	21.5	9.93	39.72	39.50	0.56	4
2450	Head	3/7/2018	21.5	13.70	54.80	52.60	4.18	5
	Body	3/5/2018	21.5	12.50	50.00	50.80	-1.57	6
2600	Head	2/28/2018	21.5	13.90	55.60	57.00	-2.46	7
	Body	2/28/2018	21.5	13.50	54.00	54.30	-0.55	8
Note: Target Values used derive from the calibration certificate Data Storage and Evaluation.								

9 Normal and Maximum Output Power

KDB 447498 D01 at the maximum rated output power and within the tune-up tolerance range specified for the product, but not more than 2 dB lower than the maximum tune-up tolerance limit.

9.1 GSM Mode

GSM 850		Burst Average Power(dBm)			Division Factors (dB)	Frame-Average Power(dBm)			Burst Tune-up Limit (dBm)
Tx Channel		128	190	251		128	190	251	
Frequency(MHz)		824.2	836.6	848.8		824.2	836.6	848.8	
GSM(GMSK)		32.99	32.62	32.53	9.03	23.96	23.59	23.50	34.00
GPRS (GMSK)	1Txslot	32.78	32.81	32.78	9.03	23.75	23.78	23.75	34.00
	2Txslots	29.66	29.68	29.68	6.02	23.64	23.66	23.66	31.00
	3Txslots	27.85	27.82	27.95	4.26	23.59	23.56	23.69	29.00
	4Txslots	26.68	26.65	26.67	3.01	23.67	23.64	23.66	28.00
EGPRS (GMSK)	1Txslot	32.65	32.64	32.65	9.03	23.62	23.61	23.62	34.00
	2Txslots	29.57	29.66	29.62	6.02	23.55	23.64	23.60	31.00
	3Txslots	27.89	27.84	27.86	4.26	23.63	23.58	23.60	29.00
	4Txslots	26.61	26.68	26.64	3.01	23.60	23.67	23.63	28.00
EGPRS (8PSK)	1Txslot	25.19	24.89	24.55	9.03	16.16	15.86	15.52	26.50
	2Txslots	22.76	22.41	22.28	6.02	16.74	16.39	16.26	24.00
	3Txslots	20.82	20.33	20.14	4.26	16.56	16.07	15.88	21.50
	4Txslots	19.80	19.66	19.00	3.01	16.79	16.65	15.99	20.50
GSM 1900 (Hotspot Off)		Power(dBm)			Division Factors (dB)	Power(dBm)			Burst Tune-up Limit (dBm)
Tx Channel		512	661	810		512	661	810	
Frequency(MHz)		1850.2	1880	1909.8		1850.2	1880	1909.8	
GSM(GMSK)		30.20	30.17	30.14	9.03	21.17	21.14	21.11	31.00
GPRS (GMSK)	1Txslot	30.45	30.34	30.21	9.03	21.42	21.31	21.18	31.00
	2Txslots	27.14	27.23	27.27	6.02	21.12	21.21	21.25	27.50
	3Txslots	25.37	25.25	25.17	4.26	21.11	20.99	20.91	25.50
	4Txslots	24.20	24.31	24.24	3.01	21.19	21.30	21.23	24.50
EGPRS (GMSK)	1Txslot	30.40	30.32	30.13	9.03	21.37	21.29	21.10	31.00
	2Txslots	27.11	27.22	27.14	6.02	21.09	21.20	21.12	27.50
	3Txslots	25.36	25.21	25.12	4.26	21.10	20.95	20.86	25.50
	4Txslots	24.16	24.22	24.20	3.01	21.15	21.21	21.19	24.50
EGPRS (8PSK)	1Txslot	24.43	24.35	24.28	9.03	15.40	15.32	15.25	25.50
	2Txslots	22.37	22.48	22.35	6.02	16.35	16.46	16.33	22.50
	3Txslots	20.32	20.37	20.36	4.26	16.06	16.11	16.10	20.50
	4Txslots	19.31	19.37	19.32	3.01	16.30	16.36	16.31	19.50



GSM 1900 (Hotspot On)		Power(dBm)			Division Factors (dB)	Power(dBm)			Burst Tune-up Limit (dBm)
Tx Channel		512	661	810		512	661	810	
Frequency(MHz)		1850.2	1880	1909.8		1850.2	1880	1909.8	
GSM(GMSK)		28.45	28.25	28.19	9.03	19.42	19.22	19.16	29.00
GPRS (GMSK)	1Txslot	28.62	28.54	28.12	9.03	19.59	19.51	19.09	29.00
	2Txslots	25.23	25.32	25.21	6.02	19.21	19.30	19.19	25.50
	3Txslots	23.32	23.38	22.87	4.26	19.06	19.12	18.61	23.50
	4Txslots	22.11	22.29	22.35	3.01	19.10	19.28	19.34	22.50
EGPRS (GMSK)	1Txslot	28.56	28.52	28.12	9.03	19.53	19.49	19.09	29.00
	2Txslots	25.20	25.33	25.26	6.02	19.18	19.31	19.24	25.50
	3Txslots	23.27	23.35	22.73	4.26	19.01	19.09	18.47	23.50
	4Txslots	22.01	22.23	22.37	3.01	19.00	19.22	19.36	22.50
EGPRS (8PSK)	1Txslot	22.77	22.68	22.28	9.03	13.74	13.65	13.25	23.50
	2Txslots	20.11	20.19	20.12	6.02	14.09	14.17	14.10	20.50
	3Txslots	18.32	18.35	17.23	4.26	14.06	14.09	12.97	18.50
	4Txslots	17.25	17.32	17.36	3.01	14.24	14.31	14.35	17.50
Notes: The worst-case configuration and mode for SAR testing is determined to be as follows: 1. Standalone: GSM 850 GMSK (GPRS) mode with 1 time slot for Max power, GSM 1900 GMSK (GPRS) mode with 1 time slot for Max power, based on the output power measurements above. 2. SAR is not required for EGPRS (8PSK) mode because its output power is less than that of GPRS Mode.									

9.2 WCDMA Mode

The following tests were completed according to the test requirements outlined in the 3GPP TS34.121 specification.

WCDMA		Band II(dBm) (Hotspot Off)				Band II(dBm) (Hotspot On)				Band V(dBm)			
Tx Channel		9262	9400	9538	Tune-up	9262	9400	9538	Tune-up	4132	4183	4233	Tune-up
Frequency(MHz)		1852.4	1880	1907.6	Limit (dBm)	1852.4	1880	1907.6	Limit (dBm)	826.4	836.6	846.6	Limit (dBm)
RMC	12.2kbps	23.20	23.10	23.12	24.50	19.03	19.04	18.82	22.50	23.86	23.78	23.85	25.00
	64kbps	23.19	23.10	23.11	24.50	19.02	19.03	18.81	22.50	23.86	23.77	23.84	25.00
	144kbps	23.18	23.08	23.11	24.50	19.00	19.03	18.80	22.50	23.84	23.74	23.82	25.00
	384kbps	23.18	23.09	23.10	24.50	19.01	19.02	18.80	22.50	23.85	23.75	23.83	25.00
HSDPA	Sub 1	22.25	22.05	22.14	23.50	18.12	18.01	18.00	21.50	22.77	22.71	22.76	24.00
	Sub 2	22.24	22.06	22.09	23.50	17.92	17.82	17.96	21.50	22.81	22.77	22.74	24.00
	Sub 3	21.68	21.58	21.60	23.00	17.45	17.45	17.40	21.00	22.26	22.30	22.33	23.50
	Sub 4	21.78	21.59	21.60	23.00	17.59	17.57	17.51	21.00	22.33	22.32	22.30	23.50
HSUPA	Sub 1	22.31	22.14	22.15	23.00	18.00	17.90	17.92	21.00	22.76	22.80	22.82	24.00
	Sub 2	21.71	21.62	21.63	22.50	17.53	17.53	17.52	20.50	22.41	22.30	22.31	23.00
	Sub 3	21.88	21.74	21.87	22.00	17.88	17.87	17.91	20.00	22.87	22.78	22.84	23.00
	Sub 4	22.27	22.09	22.17	23.00	17.99	17.89	17.88	21.00	22.87	22.81	22.78	23.50
	Sub 5	22.23	22.07	22.17	23.50	17.92	17.84	17.86	21.50	22.81	22.80	22.81	24.00
DC-HSDPA	Sub 1	22.11	22.01	22.03	23.50	18.06	18.07	17.95	21.50	22.74	22.69	22.76	24.00
	Sub 2	22.10	22.01	22.02	23.50	18.05	18.06	17.94	21.50	22.77	22.68	22.75	24.00
	Sub 3	22.09	21.99	22.00	23.50	18.05	18.03	17.93	21.50	22.75	22.65	22.72	24.00
	Sub 4	22.04	22.00	22.01	23.50	18.01	18.05	17.90	21.50	22.76	22.64	22.74	24.00

Note: 1. Per KDB 941225 D01, SAR for Head / Hotspot / Body-worn exposure is measured using a 12.2 kbps AMR with TPC bits configured to all "1's".

2. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is $\leq \frac{1}{4}$ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode.

9.3 LTE Mode

UE Power Class: 3 (23 +/- 2dBm). The allowed Maximum Power Reduction (MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS36.101.

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3

Modulation	Channel bandwidth / Transmission bandwidth (N _{RB})						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2

LTE FDD Band 5				Conducted Power(dBm)			Tune-up Limit (dBm)
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			
				20407/824.7	20525/836.5	20643/848.3	
1.4MHz	QPSK	1	0	23.28	23.47	23.43	24.50
		1	2	23.42	23.64	23.55	24.50
		1	5	23.37	23.44	23.55	24.50
		3	0	23.26	23.31	23.32	24.50
		3	2	23.19	23.33	23.35	24.50
		3	3	23.26	23.23	23.32	24.50
		6	0	22.29	22.37	22.47	23.50
	16QAM	1	0	21.96	21.85	21.99	23.50
		1	2	22.23	22.13	22.22	23.50
		1	5	22.09	22.07	22.12	23.50
		3	0	22.12	22.13	22.27	23.50
		3	2	22.24	22.25	22.28	23.50
		3	3	22.08	22.20	22.14	23.50
		6	0	21.20	21.48	21.36	22.50
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				20415/825.5	20525/836.5	20635/847.5	
3MHz	QPSK	1	0	23.30	23.51	23.46	24.50
		1	7	23.45	23.69	23.59	24.50
		1	14	23.40	23.49	23.59	24.50
		8	0	22.36	22.43	22.45	23.50
		8	4	22.31	22.43	22.47	23.50
		8	7	22.36	22.34	22.42	23.50
		15	0	22.32	22.41	22.50	23.50
	16QAM	1	0	21.99	21.87	22.02	23.50
		1	7	22.26	22.18	22.26	23.50
		1	14	22.11	22.11	22.15	23.50



		8	0	21.23	21.26	21.39	22.50
		8	4	21.35	21.38	21.40	22.50
		8	7	21.18	21.32	21.27	22.50
		15	0	21.23	21.52	21.39	22.50
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				20425/826.5	20525/836.5	20625/846.5	
5MHz	QPSK	1	0	23.27	23.49	23.42	24.50
		1	13	23.43	23.65	23.56	24.50
		1	24	23.37	23.44	23.55	24.50
		12	0	22.33	22.38	22.41	23.50
		12	6	22.29	22.39	22.42	23.50
		12	13	22.34	22.32	22.38	23.50
		25	0	22.30	22.40	22.48	23.50
	16QAM	1	0	21.96	21.83	21.99	23.50
		1	13	22.23	22.16	22.23	23.50
		1	24	22.08	22.09	22.11	23.50
		12	0	21.21	21.22	21.36	22.50
		12	6	21.32	21.33	21.36	22.50
		12	13	21.15	21.27	21.23	22.50
		25	0	21.21	21.48	21.34	22.50
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				20450/829	20525/836.5	20600/844	
10MHz	QPSK	1	0	23.25	23.42	23.40	24.50
		1	25	23.43	23.65	23.55	24.50
		1	49	23.34	23.42	23.51	24.50
		25	0	22.31	22.34	22.38	23.50
		25	13	22.27	22.35	22.39	23.50
		25	25	22.30	22.28	22.35	23.50
		50	0	22.33	22.33	22.43	23.50
	16QAM	1	0	21.91	21.80	21.94	23.50
		1	25	22.20	22.15	22.20	23.50
		1	49	22.06	22.04	22.09	23.50
		25	0	21.18	21.21	21.34	22.50
		25	13	21.28	21.30	21.32	22.50
		25	25	21.13	21.23	21.20	22.50
		50	0	21.19	21.44	21.31	22.50



LTE FDD Band 7 (Hotspot Off)				Conducted Power(dBm)			Tune-up Limit (dBm)
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			
				20775/2502.5	21100/2535	21425/2567.5	
5MHz	QPSK	1	0	22.73	22.64	22.76	24.00
		1	13	22.78	22.78	22.81	24.00
		1	24	22.75	22.54	22.68	24.00
		12	0	21.80	21.72	21.64	23.00
		12	6	21.78	21.68	21.73	23.00
		12	13	21.72	21.60	21.54	23.00
		25	0	21.65	21.62	21.65	23.00
	16QAM	1	0	21.32	21.33	21.33	23.00
		1	13	21.29	21.13	21.36	23.00
		1	24	21.23	21.27	21.21	23.00
		12	0	20.86	20.58	20.63	22.00
		12	6	20.72	20.63	20.60	22.00
		12	13	20.56	20.59	20.51	22.00
		25	0	20.58	20.55	20.54	22.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				20800/2505	21100/2535	21400/2565	
10MHz	QPSK	1	0	22.75	22.65	22.79	24.00
		1	25	22.81	22.83	22.85	24.00
		1	49	22.77	22.58	22.71	24.00
		25	0	21.83	21.77	21.68	23.00
		25	13	21.81	21.73	21.77	23.00
		25	25	21.74	21.64	21.59	23.00
		50	0	21.73	21.64	21.69	23.00
	16QAM	1	0	21.34	21.36	21.35	23.00
		1	25	21.32	21.17	21.39	23.00
		1	49	21.26	21.29	21.24	23.00
		25	0	20.89	20.63	20.67	22.00
		25	13	20.74	20.67	20.63	22.00
		25	25	20.59	20.64	20.55	22.00
		50	0	20.61	20.60	20.58	22.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				20825/2507.5	21100/2535	21375/2562.5	
15MHz	QPSK	1	0	22.74	22.61	22.77	24.00
		1	38	22.79	22.82	22.82	24.00
		1	74	22.74	22.53	22.67	24.00
		36	0	21.81	21.73	21.65	23.00



		36	18	21.78	21.68	21.73	23.00
		36	39	21.71	21.61	21.55	23.00
		75	0	21.71	21.60	21.64	23.00
	16QAM	1	0	21.29	21.34	21.33	23.00
		1	38	21.30	21.14	21.37	23.00
		1	74	21.23	21.25	21.21	23.00
		36	0	20.86	20.61	20.64	22.00
		36	18	20.71	20.62	20.59	22.00
		36	39	20.57	20.60	20.52	22.00
		75	0	20.58	20.55	20.54	22.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				20850/2510	21100/2535	21350/2560	
20MHz	QPSK	1	0	22.71	22.57	22.74	24.00
		1	50	22.78	22.78	22.80	24.00
		1	99	22.72	22.52	22.64	24.00
		50	0	21.78	21.68	21.61	23.00
		50	25	21.76	21.64	21.70	23.00
		50	50	21.68	21.56	21.51	23.00
		100	0	21.68	21.55	21.60	23.00
	16QAM	1	0	21.27	21.30	21.28	23.00
		1	50	21.26	21.12	21.33	23.00
		1	99	21.21	21.22	21.19	23.00
		50	0	20.83	20.57	20.61	22.00
		50	25	20.68	20.60	20.56	22.00
		50	50	20.54	20.55	20.48	22.00
		100	0	20.56	20.51	20.51	22.00

LTE FDD Band 7 (Hotspot On)				Conducted Power(dBm)			Tune-up Limit (dBm)
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			
				20775/2502.5	21100/2535	21425/2567.5	
5MHz	QPSK	1	0	20.65	20.83	20.75	22.00
		1	13	20.77	20.78	20.82	22.00
		1	24	20.58	20.69	20.65	22.00
		12	0	20.76	20.76	20.70	22.00
		12	6	20.73	20.72	20.69	22.00
		12	13	20.68	20.63	20.50	22.00
		25	0	20.62	20.77	20.74	22.00
	16QAM	1	0	20.47	20.40	20.70	22.00
		1	13	20.76	20.67	20.81	22.00
		1	24	20.36	20.38	20.38	22.00
		12	0	20.68	20.64	20.60	22.00



		12	6	20.73	20.82	20.78	22.00
		12	13	20.68	20.75	20.59	22.00
		25	0	20.57	20.69	20.71	22.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				20800/2505	21100/2535	21400/2565	
10MHz	QPSK	1	0	20.67	20.84	20.78	22.00
		1	25	20.80	20.83	20.86	22.00
		1	49	20.60	20.73	20.68	22.00
		25	0	20.79	20.81	20.74	22.00
		25	13	20.76	20.77	20.73	22.00
		25	25	20.70	20.67	20.55	22.00
		50	0	20.70	20.79	20.78	22.00
	16QAM	1	0	20.49	20.43	20.72	22.00
		1	25	20.79	20.71	20.84	22.00
		1	49	20.39	20.40	20.41	22.00
		25	0	20.71	20.69	20.64	22.00
		25	13	20.75	20.86	20.81	22.00
		25	25	20.71	20.80	20.63	22.00
		50	0	20.60	20.74	20.75	22.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				20825/2507.5	21100/2535	21375/2562.5	
15MHz	QPSK	1	0	20.66	20.80	20.76	22.00
		1	38	20.78	20.82	20.83	22.00
		1	74	20.57	20.68	20.64	22.00
		36	0	20.77	20.77	20.71	22.00
		36	18	20.73	20.72	20.69	22.00
		36	39	20.67	20.64	20.51	22.00
		75	0	20.68	20.75	20.73	22.00
	16QAM	1	0	20.44	20.41	20.70	22.00
		1	38	20.77	20.68	20.82	22.00
		1	74	20.36	20.36	20.38	22.00
		36	0	20.68	20.67	20.61	22.00
		36	18	20.72	20.81	20.77	22.00
		36	39	20.69	20.76	20.60	22.00
		75	0	20.57	20.69	20.71	22.00
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				20850/2510	21100/2535	21350/2560	
20MHz	QPSK	1	0	20.63	20.76	20.73	22.00
		1	50	20.77	20.78	20.81	22.00
		1	99	20.55	20.67	20.61	22.00



		50	0	20.74	20.72	20.67	22.00
		50	25	20.71	20.68	20.66	22.00
		50	50	20.64	20.59	20.47	22.00
		100	0	20.65	20.70	20.69	22.00
	16QAM	1	0	20.42	20.37	20.65	22.00
		1	50	20.73	20.66	20.78	22.00
		1	99	20.34	20.33	20.36	22.00
		50	0	20.65	20.63	20.58	22.00
		50	25	20.69	20.79	20.74	22.00
		50	50	20.66	20.71	20.56	22.00
		100	0	20.55	20.65	20.68	22.00

9.4 WLAN Mode

Wi-Fi 2.4G (WIFI data standalone)	Channel	Frequency (MHz)	Average Conducted Power (dBm) for Data Rates (bps)	Tune-up Limit (dBm)	TX Power Setting level
Mode			1M		
802.11b	1	2412	17.05	18.50	17.5
	6	2437	17.61	18.50	17.5
	11	2462	17.17	18.50	17.5
Mode	Channel	Frequency (MHz)	6M	Tune-up Limit (dBm)	TX Power Setting level
802.11g	1	2412	14.18	15.50	14.5
	2	2417	16.55	18.00	17.0
	3	2422	16.69	18.00	17.0
	6	2437	16.73	18.00	17.0
	9	2452	16.71	18.00	17.0
	10	2457	16.66	18.00	17.0
	11	2462	15.61	17.00	16.0
Mode	Channel	Frequency (MHz)	6.5M	Tune-up Limit (dBm)	TX Power Setting level
802.11n (HT20)	1	2412	14.10	15.00	14.0
	6	2437	14.19	15.00	14.0
	11	2462	13.60	15.00	14.0
Mode	Channel	Frequency (MHz)	13.5M	Tune-up Limit (dBm)	TX Power Setting level
802.11n (HT40)	3	2422	12.67	14.50	13.5
	6	2437	13.19	14.50	13.5
	9	2452	13.46	14.50	13.5

Note. 1) Initial test configuration is 802.11b mode, since the highest maximum output power.

2) For 802.11g, the Tx power is set to 14.5 for CH1, set to 16.0 for CH11, and set to 17.0 for other channel by software.



Wi-Fi 2.4G (Sensor on)	Channel	Frequency (MHz)	Average Conducted Power (dBm) for Data Rates (bps)	Tune-up Limit (dBm)	TX Power Setting level
Mode			1M		
802.11b	1	2412	12.68	14.00	13
	6	2437	12.52	14.00	13
	11	2462	12.88	14.00	13
Mode	Channel	Frequency (MHz)	6M	Tune-up Limit (dBm)	TX Power Setting level
802.11g	1	2412	12.27	14.00	13
	6	2437	12.15	14.00	13
	11	2462	12.66	14.00	13
Mode	Channel	Frequency (MHz)	6.5M	Tune-up Limit (dBm)	TX Power Setting level
802.11n (HT20)	1	2412	12.23	14.00	13
	6	2437	12.19	14.00	13
	11	2462	12.66	14.00	13
Mode	Channel	Frequency (MHz)	13.5M	Tune-up Limit (dBm)	TX Power Setting level
802.11n (HT40)	3	2422	12.28	14.00	13
	6	2437	12.92	14.00	13
	9	2452	12.97	14.00	13

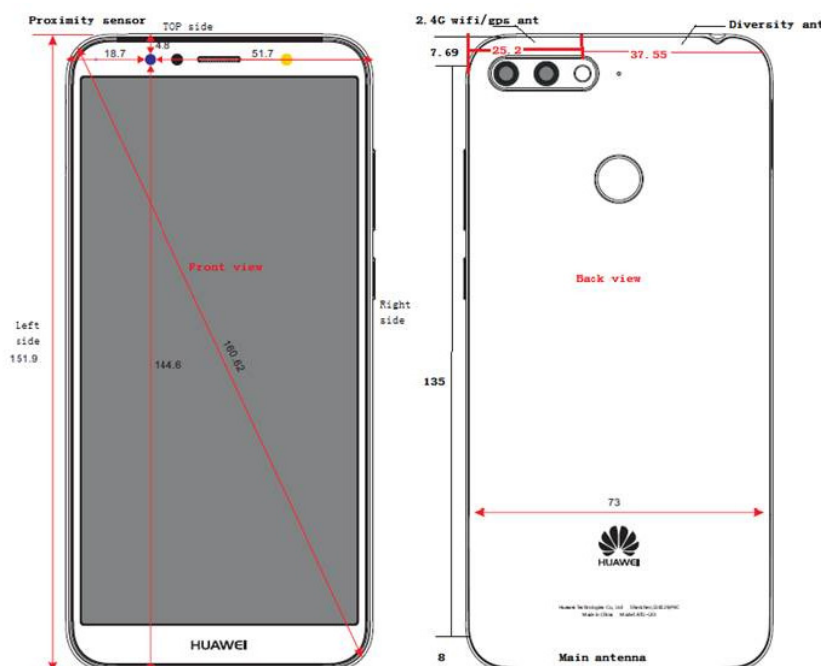
Note: Initial test configuration is 802.11n HT40 mode, since the highest maximum output power and the largest channel bandwidth.

9.5 Bluetooth Mode

BT	Conducted Power(dBm)			Tune-up Limit (dBm)
	Channel/Frequency(MHz)			
	Ch 0/2402 MHz	Ch 39/2441 MHz	Ch 78/2480 MHz	
GFSK	9.09	9.46	8.70	11.00
π/4DQPSK	7.65	7.98	7.30	11.00
8DPSK	7.73	8.10	7.26	11.00
BLE	Ch 0/2402 MHz	Ch 19/2440 MHz	Ch 39/2480 MHz	Tune-up Limit (dBm)
GFSK	-2.06	-1.45	-2.21	1.00

10 Measured and Reported (Scaled) SAR Results

10.1 EUT Antenna Locations



Overall (Length x Width): 151.9 mm x 73 mm

Overall Diagonal: 160.62 mm

Distance of the Antenna to the EUT surface/edge

Antenna	Back Side	Front side	Left Edge	Right Edge	Top Edge	Bottom Edge
Main-Antenna	0	0	<25mm	<25mm	>25mm	<25mm
BT/Wi-Fi Antenna	0	0	>25mm	<25mm	<25mm	>25mm

Hotspot mode, Positions for SAR tests

Mode	Back Side	Front side	Left Edge	Right Edge	Top Edge	Bottom Edge
Main-Antenna	Yes	Yes	Yes	Yes	N/A	Yes
BT/Wi-Fi Antenna	Yes	Yes	N/A	Yes	Yes	N/A

Note: 1. Per KDB 941225 D06, when the overall device length and width are $\geq 9\text{cm} \times 5\text{cm}$, the test distance is 10mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge.

2. For smart phones with an overall diagonal dimension is 160.62mm. Per KDB 648474 D04, for smart phones with a display diagonal dimension $> 15.0\text{ cm}$ or an overall diagonal dimension $> 16.0\text{ cm}$, 10-g extremity SAR must be tested as a phablet to determine SAR compliance. For Phablet, Since hotspot mode 1-g reported SAR $< 1.2\text{ W/kg}$, 10-g extremity SAR is no required.

3. Per FCC KDB Publication 447498 D01, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is $\leq 0.8\text{ W/kg}$ (for 1g SAR) or $\leq 2\text{ W/kg}$ (for 10g SAR) then testing at the other channels is not required for such test configuration(s).

4. When the original highest measured SAR is $\geq 0.80\text{ W/kg}$, the measurement was repeated once.

5. Per FCC KDB Publication 648474 D04, SAR was evaluated without a headset connected to the device. Since the reported SAR was $\leq 1.2\text{ W/kg}$, no additional SAR evaluations using a headset cable were required.

10.2 Standalone SAR test exclusion considerations

Per KDB 447498 D01, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$ for 1-g SAR and ≤ 7.5 for 10-g extremity SAR

- $f(\text{GHz})$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

Per KDB 447498 D01, when the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Bluetooth	Distance (mm)	MAX Power (dBm)	Frequency (MHz)	Ratio	Evaluation
Head	5	11.00	2480	3.97	Yes
Body-worn	15	11.00	2480	1.32	No
Hotspot	10	11.00	2480	1.98	No
Extremity	5	11.00	2480	3.97	No

10.3 Measured SAR Results

Table 1: GSM 850

Test Position	Cover Type	Channel/Frequency (MHz)	Time slot	Duty Cycle	Tune-up limit (dBm)	Conducted Power (dBm)	Drift (dB)	Measured SAR _{1g} (W/kg)	Scaling Factor	Reported SAR _{1g} (W/kg)	Plot No.
Head SAR											
Left Cheek	standard	190/836.6	GSM	1:8.3	34.00	32.62	-0.022	0.151	1.37	0.207	/
Left Tilt	standard	190/836.6	GSM	1:8.3	34.00	32.62	0.090	0.091	1.37	0.124	/
Right Cheek	standard	190/836.6	GSM	1:8.3	34.00	32.62	-0.045	0.211	1.37	0.290	9
Right Tilt	standard	190/836.6	GSM	1:8.3	34.00	32.62	0.040	0.113	1.37	0.155	/
Right Cheek	Battery 2	190/836.6	GSM	1:8.3	34.00	32.62	0.021	0.201	1.37	0.276	/
Right Cheek	Battery 3	190/836.6	GSM	1:8.3	34.00	32.62	0.030	0.195	1.37	0.268	/
Body-worn (Distance 15mm)											
Back Side	standard	190/836.6	GSM	1:8.3	34.00	32.62	0.020	0.261	1.37	0.359	10
Front Side	standard	190/836.6	GSM	1:8.3	34.00	32.62	-0.030	0.178	1.37	0.245	/
Back Side	Battery 2	190/836.6	GSM	1:8.3	34.00	32.62	0.017	0.240	1.37	0.330	/
Back Side	Battery 3	190/836.6	GSM	1:8.3	34.00	32.62	0.033	0.244	1.37	0.335	/
Hotspot (Distance 10mm)											
Back Side	standard	190/836.6	1Txslot	1:8.3	34.00	32.81	0.090	0.264	1.32	0.347	11
Front Side	standard	190/836.6	1Txslot	1:8.3	34.00	32.81	-0.010	0.167	1.32	0.220	/
Left Edge	standard	190/836.6	1Txslot	1:8.3	34.00	32.81	-0.046	0.037	1.32	0.049	/
Right Edge	standard	190/836.6	1Txslot	1:8.3	34.00	32.81	0.032	0.025	1.32	0.032	/
Top Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bottom Edge	standard	190/836.6	1Txslot	1:8.3	34.00	32.81	-0.060	0.050	1.32	0.066	/
Note: 1. The value with blue color is the maximum SAR Value of each test band.											
2. When multiple slots are used, SAR should be tested to account for the maximum source-based time-averaged output power.											



Table 2: GSM 1900

Test Position	Cover Type	Channel/Frequency (MHz)	Time slot	Duty Cycle	Tune-up limit (dBm)	Conducted Power (dBm)	Drift (dB)	Measured SAR _{1g} (W/kg)	Scaling Factor	Reported SAR _{1g} (W/kg)	Plot No.
Head SAR											
Left Cheek	standard	661/1880	GSM	1:8.3	31.00	30.17	-0.079	0.157	1.21	0.190	12
Left Tilt	standard	661/1880	GSM	1:8.3	31.00	30.17	-0.110	0.057	1.21	0.069	/
Right Cheek	standard	661/1880	GSM	1:8.3	31.00	30.17	0.075	0.095	1.21	0.115	/
Right Tilt	standard	661/1880	GSM	1:8.3	31.00	30.17	-0.190	0.080	1.21	0.096	/
Left Cheek	Battery 2	661/1880	GSM	1:8.3	31.00	30.17	-0.084	0.148	1.21	0.179	/
Left Cheek	Battery 3	661/1880	GSM	1:8.3	31.00	30.17	0.052	0.153	1.21	0.185	/
Body-worn (Distance 15mm)											
Back Side	standard	661/1880	GSM	1:8.3	31.00	30.17	0.140	0.170	1.21	0.206	13
Front Side	standard	661/1880	GSM	1:8.3	31.00	30.17	-0.070	0.110	1.21	0.133	/
Hotspot (Distance 10mm)											
Back Side	standard	661/1880	1Txslot	1:8.3	29.00	28.54	-0.080	0.333	1.11	0.370	/
Front Side	standard	661/1880	1Txslot	1:8.3	29.00	28.54	0.110	0.252	1.11	0.280	/
Left Edge	standard	661/1880	1Txslot	1:8.3	29.00	28.54	0.016	0.065	1.11	0.072	/
Right Edge	standard	661/1880	1Txslot	1:8.3	29.00	28.54	0.024	0.042	1.11	0.046	/
Top Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bottom Edge	standard	661/1880	1Txslot	1:8.3	29.00	28.54	0.150	0.561	1.11	0.624	14
Bottom Edge	Battery 2	661/1880	1Txslot	1:8.3	29.00	28.54	0.087	0.548	1.11	0.609	/
Bottom Edge	Battery 3	661/1880	1Txslot	1:8.3	29.00	28.54	-0.120	0.551	1.11	0.613	/
Note: 1. The value with blue color is the maximum SAR Value of each test band.											
2. When multiple slots are used, SAR should be tested to account for the maximum source-based time-averaged output power.											



Table 3: UMTS Band II

Test Position	Cover Type	Channel/Frequency (MHz)	Channel Type	Duty Cycle	Tune-up limit (dBm)	Conducted Power (dBm)	Drift (dB)	Measured SAR _{1g} (W/kg)	Scaling Factor	Reported SAR _{1g} (W/kg)	Plot No.
Head SAR											
Left Cheek	standard	9400/1880	RMC 12.2K	1:1	24.50	23.10	0.120	0.313	1.38	0.432	15
Left Tilt	standard	9400/1880	RMC 12.2K	1:1	24.50	23.10	-0.023	0.119	1.38	0.164	/
Right Cheek	standard	9400/1880	RMC 12.2K	1:1	24.50	23.10	0.040	0.198	1.38	0.273	/
Right Tilt	standard	9400/1880	RMC 12.2K	1:1	24.50	23.10	-0.040	0.182	1.38	0.251	/
Left Cheek	Battery 2	9400/1880	RMC 12.2K	1:1	24.50	23.10	0.024	0.289	1.38	0.399	/
Left Cheek	Battery 3	9400/1880	RMC 12.2K	1:1	24.50	23.10	-0.035	0.281	1.38	0.388	/
Body-worn (Distance 15mm)											
Back Side	standard	9400/1880	RMC 12.2K	1:1	24.50	23.10	0.190	0.255	1.38	0.352	16
Front Side	standard	9400/1880	RMC 12.2K	1:1	24.50	23.10	-0.030	0.194	1.38	0.268	/
Hotspot (Distance 10mm)											
Back Side	standard	9538/1907.6	RMC 12.2K	1:1	20.00	19.04	-0.021	0.406	1.25	0.506	/
Front Side	standard	9400/1880	RMC 12.2K	1:1	20.00	19.04	0.018	0.355	1.25	0.443	/
Left Edge	standard	9400/1880	RMC 12.2K	1:1	20.00	19.04	0.120	0.071	1.25	0.089	/
Right Edge	standard	9400/1880	RMC 12.2K	1:1	20.00	19.04	0.025	0.052	1.25	0.065	/
Top Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bottom Edge	standard	9400/1880	RMC 12.2K	1:1	20.00	19.04	0.033	0.601	1.25	0.750	17
Bottom Edge	Battery 2	9262/1852.4	RMC 12.2K	1:1	20.00	19.04	0.041	0.586	1.25	0.731	/
Bottom Edge	Battery 3	9262/1852.4	RMC 12.2K	1:1	20.00	19.04	-0.058	0.579	1.25	0.722	/
Note: 1. The value with blue color is the maximum SAR Value of each test band. 2. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is $\leq \frac{1}{4}$ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode.											

Table 4: UMTS Band V

Test Position	Cover Type	Channel/Frequency (MHz)	Channel Type	Duty Cycle	Tune-up limit (dBm)	Conducted Power (dBm)	Drift (dB)	Measured SAR _{1g} (W/kg)	Scaling Factor	Reported SAR _{1g} (W/kg)	Plot No.
Head SAR											
Left Cheek	standard	4183/836.6	RMC 12.2K	1:1	25.00	23.78	-0.069	0.274	1.32	0.363	/
Left Tilt	standard	4183/836.6	RMC 12.2K	1:1	25.00	23.78	0.075	0.172	1.32	0.228	/
Right Cheek	standard	4183/836.6	RMC 12.2K	1:1	25.00	23.78	0.050	0.290	1.32	0.384	18
Right Tilt	standard	4183/836.6	RMC 12.2K	1:1	25.00	23.78	0.140	0.181	1.32	0.240	/
Right Cheek	Battery 2	4183/836.6	RMC 12.2K	1:1	25.00	23.78	0.024	0.281	1.32	0.372	/
Right Cheek	Battery 3	4183/836.6	RMC 12.2K	1:1	25.00	23.78	-0.039	0.273	1.32	0.362	/
Body-worn (Distance 15mm)											
Back Side	standard	4183/836.6	RMC 12.2K	1:1	25.00	23.78	0.030	0.356	1.32	0.471	19
Front Side	standard	4183/836.6	RMC 12.2K	1:1	25.00	23.78	0.050	0.246	1.32	0.326	/
Hotspot (Distance 10mm)											
Back Side	standard	4183/836.6	RMC 12.2K	1:1	25.00	23.78	0.010	0.381	1.32	0.505	20
Front Side	standard	4183/836.6	RMC 12.2K	1:1	25.00	23.78	0.030	0.271	1.32	0.359	/
Left Edge	standard	4183/836.6	RMC 12.2K	1:1	25.00	23.78	0.018	0.037	1.32	0.049	/
Right Edge	standard	4183/836.6	RMC 12.2K	1:1	25.00	23.78	0.047	0.029	1.32	0.038	/
Top Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bottom Edge	standard	4183/836.6	RMC 12.2K	1:1	25.00	23.78	0.060	0.069	1.32	0.091	/
Back Side	Battery 2	4183/836.6	RMC 12.2K	1:1	25.00	23.78	0.120	0.376	1.32	0.498	/
Back Side	Battery 3	4183/836.6	RMC 12.2K	1:1	25.00	23.78	-0.036	0.369	1.32	0.489	/
Note: 1. The value with blue color is the maximum SAR Value of each test band. 2. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is $\leq \frac{1}{4}$ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode											



Table 5: LTE Band 5 (10MHz)

Test Position	Cover Type	RB size	RB offset	Channel/ Frequency (MHz)	Maximum Allowed Power (dBm)	Conducted Power (dBm)	Drift (dB)	Measured SAR _{1g} (W/kg)	Scaling Factor	Reported SAR _{1g} (W/kg)	Plot No.
Head SAR (QPSK)											
Left Cheek	standard	1RB	25	20525/836.5	24.50	23.65	0.037	0.235	1.22	0.286	/
Left Tilt	standard	1RB	25	20525/836.5	24.50	23.65	0.013	0.154	1.22	0.187	/
Right Cheek	standard	1RB	25	20525/836.5	24.50	23.65	0.150	0.247	1.22	0.300	21
Right Tilt	standard	1RB	25	20525/836.5	24.50	23.65	0.042	0.168	1.22	0.204	/
Left Cheek	standard	50%RB	13	20600/844	23.50	22.39	0.024	0.177	1.29	0.229	/
Left Tilt	standard	50%RB	13	20600/844	23.50	22.39	0.070	0.114	1.29	0.147	/
Right Cheek	standard	50%RB	13	20600/844	23.50	22.39	0.030	0.181	1.29	0.234	/
Right Tilt	standard	50%RB	13	20600/844	23.50	22.39	0.019	0.136	1.29	0.176	/
Right Cheek	Battery 2	1RB	25	20525/836.5	24.50	23.65	0.012	0.239	1.22	0.291	/
Right Cheek	Battery 3	1RB	25	20525/836.5	24.50	23.65	0.087	0.234	1.22	0.285	/
Body-worn (QPSK, Distance 15mm)											
Back Side	standard	1RB	25	20525/836.5	24.50	23.65	0.150	0.243	1.22	0.296	22
Front Side	standard	1RB	25	20525/836.5	24.50	23.65	-0.040	0.173	1.22	0.210	/
Back Side	standard	50%RB	13	20600/844	23.50	22.39	0.120	0.204	1.29	0.263	/
Front Side	standard	50%RB	13	20600/844	23.50	22.39	0.010	0.145	1.29	0.187	/
Hotspot (QPSK, Distance 10mm)											
Back Side	standard	1RB	25	20525/836.5	24.50	23.65	0.010	0.297	1.22	0.361	23
Front Side	standard	1RB	25	20525/836.5	24.50	23.65	-0.030	0.231	1.22	0.281	/
Left Edge	standard	1RB	25	20525/836.5	24.50	23.65	0.021	0.033	1.22	0.040	/
Right Edge	standard	1RB	25	20525/836.5	24.50	23.65	-0.014	0.029	1.22	0.036	/
Top Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bottom Edge	standard	1RB	25	20525/836.5	24.50	23.65	0.080	0.079	1.22	0.096	/
Back Side	standard	50%RB	13	20600/844	23.50	22.39	0.130	0.218	1.29	0.281	/
Front Side	standard	50%RB	13	20600/844	23.50	22.39	0.000	0.164	1.29	0.212	/
Left Edge	standard	50%RB	13	20600/844	23.50	22.39	-0.034	0.028	1.29	0.037	/
Right Edge	standard	50%RB	13	20600/844	23.50	22.39	0.074	0.022	1.29	0.028	/
Top Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bottom Edge	standard	50%RB	13	20600/844	23.50	22.39	0.150	0.059	1.29	0.076	/
Back Side	Battery 2	1RB	25	20525/836.5	24.50	23.65	0.036	0.224	1.22	0.272	/
Back Side	Battery 3	1RB	25	20525/836.5	24.50	23.65	0.130	0.231	1.22	0.281	/
Note: 1. The value with blue color is the maximum SAR Value of each test band. 2. For QPSK with 100% RB allocation, SAR is required when and the highest reported SAR for 1 RB and 50% RB allocation in are ≥ 0.8 W/kg.											



Table 6: LTE Band 7 (20MHz, Main-antenna)

Test Position	Cover Type	RB size	RB offset	Channel/ Frequency (MHz)	Maximum Allowed Power (dBm)	Conducted Power (dBm)	Drift (dB)	Measured SAR _{1g} (W/kg)	Scaling Factor	Reported SAR _{1g} (W/kg)	Plot No.
Head SAR (QPSK)											
Right Cheek	standard	1RB	50	21350/2560	24.00	22.80	0.061	0.109	1.32	0.143	24
Left Cheek	standard	1RB	50	21350/2560	24.00	22.80	0.021	0.061	1.32	0.080	/
Left Tilt	standard	1RB	50	21350/2560	24.00	22.80	0.141	0.072	1.32	0.094	/
Right Tilt	standard	1RB	50	21350/2560	24.00	22.80	0.083	0.061	1.32	0.081	/
Left Cheek	standard	50%RB	0	20850/2510	23.00	21.87	0.096	0.095	1.30	0.123	/
Left Tilt	standard	50%RB	0	20850/2510	23.00	21.87	0.057	0.062	1.30	0.081	/
Right Cheek	standard	50%RB	0	20850/2510	23.00	21.87	0.023	0.081	1.30	0.105	/
Right Tilt	standard	50%RB	0	20850/2510	23.00	21.87	0.021	0.067	1.30	0.087	/
Left Cheek	Battery 2	1RB	50	21350/2560	24.00	22.80	0.054	0.099	1.32	0.131	/
Left Cheek	Battery 3	1RB	50	21350/2560	24.00	22.80	-0.087	0.094	1.32	0.124	/
Body-worn (QPSK, Distance 15mm)											
Back Side	standard	1RB	50	21350/2560	24.00	22.80	-0.101	0.257	1.32	0.339	25
Front Side	standard	1RB	50	21350/2560	24.00	22.80	0.102	0.144	1.32	0.190	/
Back Side	standard	50%RB	0	20850/2510	23.00	21.87	0.114	0.218	1.30	0.283	/
Front Side	standard	50%RB	0	20850/2510	23.00	21.87	0.167	0.127	1.30	0.165	/
Hotspot (QPSK, Distance 10mm)											
Back Side	standard	1RB	50	21350/2560	22.00	20.81	0.039	0.366	1.32	0.481	/
Front Side	standard	1RB	50	21350/2560	22.00	20.81	0.100	0.225	1.32	0.296	/
Left Edge	standard	1RB	50	21350/2560	22.00	20.81	0.044	0.092	1.32	0.121	/
Right Edge	standard	1RB	50	21350/2560	22.00	20.81	0.032	0.077	1.32	0.101	/
Top Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bottom Edge	standard	1RB	50	21350/2560	22.00	20.81	0.090	0.490	1.32	0.644	/
Back Side	standard	50%RB	0	20850/2510	22.00	20.74	0.027	0.275	1.34	0.368	/
Front Side	standard	50%RB	0	20850/2510	22.00	20.74	0.012	0.203	1.34	0.271	/
Left Edge	standard	50%RB	0	20850/2510	22.00	20.74	0.016	0.085	1.34	0.114	/
Right Edge	standard	50%RB	0	20850/2510	22.00	20.74	0.033	0.062	1.34	0.083	/
Top Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bottom Edge	standard	50%RB	0	20850/2510	22.00	20.74	-0.080	0.554	1.34	0.740	26
Bottom Edge	Battery 2	50%RB	0	20850/2510	22.00	20.74	-0.045	0.524	1.34	0.700	/
Bottom Edge	Battery 3	50%RB	0	20850/2510	22.00	20.74	0.037	0.537	1.34	0.718	/
Note: 1. The value with blue color is the maximum SAR Value of each test band. 2. For QPSK with 100% RB allocation, SAR is required when and the highest reported SAR for 1 RB and 50% RB allocation in are ≥ 0.8 W/kg.											



Table 7: Wi-Fi (2.4G)

WIFI data standalone

Test Position	Cover Type	Channel/ Frequency (MHz)	Mode 802.11b	Duty Cycle	Tune-up limit (dBm)	Conducted Power (dBm)	Drift (dB)	Area Scan Max.SAR (W/Kg)	Measured SAR _{1g} (W/kg)	Scaling Factor	Reported SAR _{1g} (W/kg)	Plot No.
Head SAR												
Left Cheek	standard	11/2462	DSSS	97.72%	18.50	17.17	0.096	0.876	0.772	1.39	1.073	27
		6/2437	DSSS	97.72%	18.50	17.61	0.069	0.783	0.767	1.26	0.963	/
		1/2412	DSSS	97.72%	18.50	17.05	0.120	0.743	0.742	1.43	1.060	/
Left Tilt	standard	6/2437	DSSS	97.72%	18.50	17.61	0.080	0.686	0.693	1.26	0.870	/
Right Cheek	standard	6/2437	DSSS	97.72%	18.50	17.61	0.039	0.492	0.513	1.26	0.644	/
Right Tilt	standard	6/2437	DSSS	97.72%	18.50	17.61	0.030	0.435	0.457	1.26	0.574	/
Left Cheek	Battery 2	11/2462	DSSS	97.72%	18.50	17.17	0.069	0.822	0.753	1.39	1.047	/
Left Cheek	Battery 3	11/2462	DSSS	97.72%	18.50	17.17	0.038	0.841	0.766	1.39	1.065	/
Body-worn (Distance 15mm)												
Back Side	standard	6/2437	DSSS	97.72%	18.50	17.61	0.031	0.098	0.099	1.26	0.125	28
Front Side	standard	6/2437	DSSS	97.72%	18.50	17.61	0.090	0.084	0.085	1.26	0.107	/
Hotspot (Distance 10mm)												
Back Side	standard	6/2437	DSSS	97.72%	18.50	17.61	-0.070	0.186	0.191	1.26	0.240	29
Front Side	standard	6/2437	DSSS	97.72%	18.50	17.61	0.068	0.156	0.163	1.26	0.205	/
Left Edge	standard	6/2437	DSSS	97.72%	18.50	17.61	0.087	0.013	0.014	1.26	0.018	/
Right Edge	standard	6/2437	DSSS	97.72%	18.50	17.61	0.130	0.074	0.082	1.26	0.103	/
Top Edge	standard	6/2437	DSSS	97.72%	18.50	17.61	0.100	0.179	0.183	1.26	0.230	/
Bottom Edge	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Back Side	Battery 2	6/2437	DSSS	97.72%	18.50	17.61	0.036	0.181	0.186	1.26	0.234	/
Back Side	Battery 3	6/2437	DSSS	97.72%	18.50	17.61	-0.030	0.177	0.189	1.26	0.237	/
Note: 1. The value with blue color is the maximum SAR Value of each test band.												
2. Initial test configuration is 802.11b mode, since the highest maximum output power.												



Sensor on

Test Position	Cover Type	Channel/ Frequency (MHz)	Mode 802.11n HT40	Duty Cycle	Tune-up limit (dBm)	Conducted Power (dBm)	Drift (dB)	Area Scan Max.SAR (W/Kg)	Measured SAR _{1g} (W/kg)	Scaling Factor	Reported SAR _{1g} (W/kg)	Plot No.
Head SAR												
Left Cheek	standard	9/2452	OFDM	76.92%	14.00	12.97	0.024	0.359	0.424	1.65	0.699	30
Left Tilt	standard	9/2452	OFDM	76.92%	14.00	12.97	0.027	0.342	0.398	1.65	0.656	/
Right Cheek	standard	9/2452	OFDM	76.92%	14.00	12.97	0.031	0.21	0.268	1.65	0.442	/
Right Tilt	standard	9/2452	OFDM	76.92%	14.00	12.97	0.120	0.199	0.246	1.65	0.405	/
Left Cheek	Battery 2	9/2452	OFDM	76.92%	14.00	12.97	0.016	0.373	0.422	1.65	0.695	/
Left Cheek	Battery 3	9/2452	OFDM	76.92%	14.00	12.97	0.044	0.380	0.419	1.65	0.690	/
Note: 1. The value with blue color is the maximum SAR Value of each test band. 2. Initial test configuration is 802.11n HT40 mode, since the highest maximum output power and the largest channel bandwidth.												

MAX Adjusted SAR							
Mode	Test Position	Channel/ Frequency(MHz)	MAX Reported SAR _{1g} (W/kg)	802.11b Tune-up limit (dBm)	Tune-up limit (dBm)	Scaling Factor	Adjusted SAR _{1g} (W/kg)
802.11g	Left Cheek	11/2462	1.073	18.50	18.00	0.89	0.956
802.11n HT20	Left Cheek	11/2462	1.073	18.50	15.00	0.45	0.479
802.11n HT40	Left Cheek	11/2462	1.073	18.50	14.50	0.40	0.427
Note: SAR is not required for OFDM when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.							

Table 8: BT

Test Position	Cover Type	Channel/Frequency (MHz)	Mode	Duty Cycle	Tune-up limit (dBm)	Conducted Power (dBm)	Drift (dB)	Area Scan Max.SAR (W/Kg)	Measured SAR _{1g} (W/kg)	Scaling Factor	Reported SAR _{1g} (W/kg)	Plot No.
Head SAR												
Left Cheek	standard	39/2441	GFSK	76.92%	11.00	9.46	0.110	0.089	0.097	1.85	0.180	31
Left Tilt	standard	39/2441	GFSK	76.92%	11.00	9.46	0.012	0.058	0.064	1.85	0.118	/
Right Cheek	standard	39/2441	GFSK	76.92%	11.00	9.46	0.020	0.047	0.058	1.85	0.107	/
Right Tilt	standard	39/2441	GFSK	76.92%	11.00	9.46	0.066	0.024	0.023	1.85	0.042	/
Left Cheek	Battery 2	39/2441	GFSK	76.92%	11.00	9.46	0.044	0.091	0.093	1.85	0.172	/
Left Cheek	Battery 3	39/2441	GFSK	76.92%	11.00	9.46	0.032	0.088	0.090	1.85	0.166	/
Note: 1. The value with blue color is the maximum SAR Value of each test band. 2. Initial test configuration is 802.11b mode, since the highest maximum output power.												

Band	Configuration	Frequency (MHz)	Maximum Power (dBm)	Separation Distance (mm)	Estimated SAR (W/kg)
Bluetooth	Body-worn	2480	11.00	15	0.176
	Hotspot	2480	11.00	10	0.264
	Extremity	2480	11.00	5	0.211
For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01 based on the formula below. $(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm}) \cdot [\sqrt{f(\text{GHz})} / x] \text{ W/kg}$ for test separation distances ≤ 50 mm; where $x = 7.5$ for 1-g SAR, and $x = 18.75$ for 10-g SAR.					

10.4 Simultaneous Transmission Analysis

Simultaneous Transmission Configurations	Head	Body-worn	Hotspot	Product Specific 10-g SAR (Separation 0mm)
GSM(Voice) + Bluetooth(data)	Yes	Yes	N/A	Yes
GPRS/EDGE(Data) + Bluetooth(data)	N/A	Yes	Yes	Yes
WCDMA(Voice) + Bluetooth(data)	Yes	Yes	N/A	Yes
WCDMA(Data) + Bluetooth(data)	N/A	Yes	Yes	Yes
LTE(Data) + Bluetooth(data)	Yes	Yes	Yes	Yes
GSM(Voice) + Wi-Fi-2.4GHz(data)	Yes	Yes	N/A	Yes
GPRS/EDGE(Data) + Wi-Fi-2.4GHz(data)	N/A	Yes	Yes	Yes
WCDMA(Voice) + Wi-Fi-2.4GHz(data)	Yes	Yes	N/A	Yes
WCDMA(Data) + Wi-Fi-2.4GHz(data)	N/A	Yes	Yes	Yes
LTE(Data) + Wi-Fi-2.4GHz(data)	Yes	Yes	Yes	Yes
Wi-Fi-2.4GHz(data) + Bluetooth(data)	N/A	N/A	N/A	N/A

General Note:

- The Scaled SAR summation is calculated based on the same configuration and test position.
- Per KDB 447498 D01, simultaneous transmission SAR is compliant if,
 - Scalar SAR summation $< 1.6\text{W/kg}$, simultaneously transmission SAR measurement is not necessary.
 - $\text{SPLSR} = (\text{SAR}_1 + \text{SAR}_2)^{1.5} / (\text{min. separation distance, mm})$, and the peak separation distance is determined from the square root of $[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$, where (x_1, y_1, z_1) and (x_2, y_2, z_2) are the coordinates of the extrapolated peak SAR locations in the zoom scan.
 - If $\text{SPLSR} \leq 0.04$, simultaneously transmission SAR measurement is not necessary.

The maximum SAR_{1g} Value for Main- Antenna

SAR _{1g} (W/kg)		GSM 850	GSM 1900	WCDMA Band II	WCDMA Band V	LTE FDD 5	LTE FDD 7	MAX. SAR _{1g}
Test Position								
Left Cheek		0.207	0.190	0.432	0.363	0.286	0.143	0.432
Left Tilt		0.124	0.069	0.164	0.228	0.187	0.081	0.228
Right Cheek		0.290	0.115	0.273	0.384	0.300	0.105	0.384
Right Tilt		0.155	0.096	0.251	0.240	0.204	0.087	0.251
Body worn	Back Side	0.359	0.206	0.352	0.471	0.296	0.339	0.471
	Front Side	0.245	0.133	0.268	0.326	0.210	0.190	0.326
Hotspot	Back Side	0.347	0.370	0.506	0.505	0.361	0.481	0.506
	Front Side	0.220	0.280	0.443	0.359	0.281	0.296	0.443
	Left Edge	0.049	0.072	0.089	0.049	0.040	0.121	0.121
	Right Edge	0.032	0.046	0.065	0.038	0.036	0.101	0.101
	Top Edge	N/A	N/A	N/A	N/A	N/A	N/A	0
	Bottom Edge	0.066	0.624	0.750	0.091	0.096	0.740	0.75

About BT and Main- Antenna

SAR _{1g} (W/kg)		Main-antenna	BT	MAX. Σ SAR _{1g}
Test Position				
Left, Cheek		0.432	0.180	0.612
Left, Tilt		0.228	0.118	0.346
Right, Cheek		0.384	0.107	0.491
Right, Tilt		0.251	0.042	0.293
Body worn	Back Side	0.471	0.176	0.647
	Front Side	0.326	0.176	0.502
Hotspot	Back Side	0.506	0.264	0.770
	Front Side	0.443	0.264	0.707
	Left Edge	0.121	0.264	0.385
	Right Edge	0.101	0.264	0.365
	Top Edge	0	0.264	0.264
	Bottom Edge	0.750	0	0.750
Note: 1.The value with blue color is the maximum Σ SAR _{1g} Value. 2. MAX. Σ SAR _{1g} =Unlicensed SAR _{MAX} +Licensed SAR _{MAX}				

MAX. Σ SAR_{1g} = 0.770 W/kg <1.6 W/kg, so the Simultaneous transimition SAR with volum scan are not required for BT and Main-Antenna.

About Wi-Fi and Main- Antenna

SAR _{1g} (W/kg)		Main-antenna	Wi-Fi 2.4G	MAX. Σ SAR _{1g}
Test Position				
Left, Cheek		0.432	0.699	1.131
Left, Tilt		0.228	0.656	0.884
Right, Cheek		0.384	0.442	0.826
Right, Tilt		0.251	0.405	0.656
Body worn	Back Side	0.471	0.125	0.596
	Front Side	0.326	0.107	0.433
Hotspot	Back Side	0.506	0.240	0.746
	Front Side	0.443	0.205	0.648
	Left Edge	0.121	0.018	0.139
	Right Edge	0.101	0.103	0.204
	Top Edge	0	0.230	0.230
	Bottom Edge	0.750	N/A	0.750
Note: 1.The value with blue color is the maximum Σ SAR _{1g} Value. 2. MAX. Σ SAR _{1g} =Unlicensed SAR _{MAX} +Licensed SAR _{MAX}				

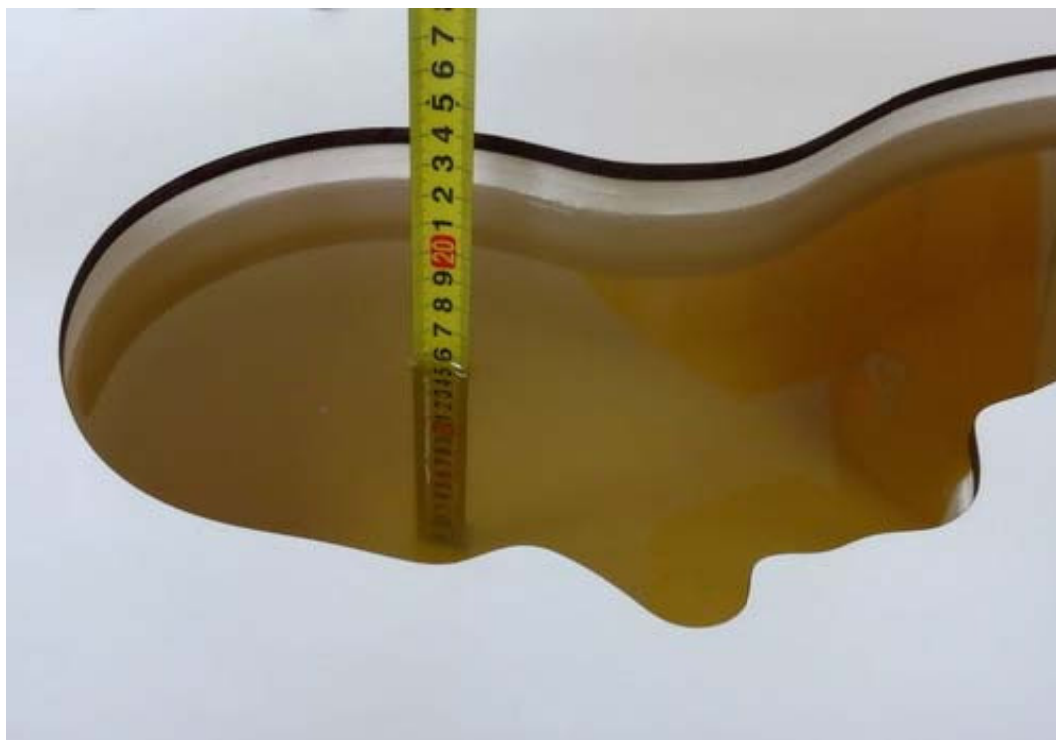
MAX. Σ SAR_{1g} = 1.131 W/kg <1.6 W/kg, so the Simultaneous transimition SAR with volum scan are not required for Wi-Fi and Main-Antenna.

11 Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528- 2013 is not required in SAR reports submitted for equipment approval. This also applies to the 10-g SAR required for phablets in KDB Publication 648474.

ANNEX A: Test Layout





Picture 3: Liquid depth in the head Phantom (835MHz, 15.3cm depth)



Picture 4: Liquid depth in the flat Phantom (835MHz, 15.4cm depth)



Picture 5: liquid depth in the head Phantom (1900 MHz, 15.3cm depth)



Picture 6: Liquid depth in the flat Phantom (1900 MHz, 15.2cm depth)



Picture 7: Liquid depth in the head Phantom (2450 MHz, 15.4cm depth)



Picture 8: Liquid depth in the flat Phantom (2450 MHz, 15.3cm depth)



Picture 9: Liquid depth in the head Phantom (2600 MHz, 15.4cm depth)



Picture 10: Liquid depth in the flat Phantom (2600 MHz, 15.3cm depth)

ANNEX B: System Check Results

Plot 1 System Performance Check at 835 MHz Head TSL

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d020

Date: 2/26/2018

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.88 \text{ mho/m}$; $\epsilon_r = 41.4$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 22.3°C Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(10.23, 10.23, 10.23); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=15mm, Pin=250mW/Area Scan (41x121x1): Measurement grid: $dx=1.500 \text{ mm}$, $dy=1.500 \text{ mm}$

Maximum value of SAR (interpolated) = 2.64 mW/g

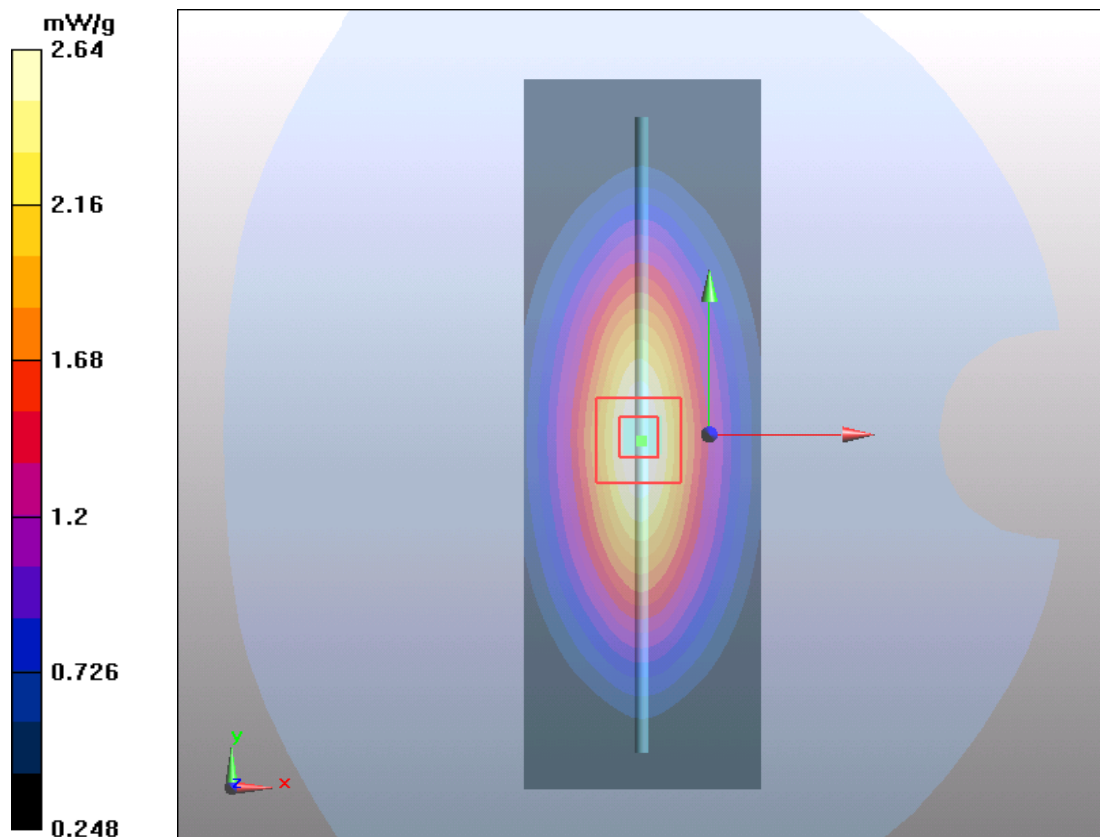
d=15mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 54.4 V/m ; Power Drift = -0.076 dB

Peak SAR (extrapolated) = 3.67 W/kg

SAR(1 g) = 2.44 mW/g ; SAR(10 g) = 1.6 mW/g

Maximum value of SAR (measured) = 2.64 mW/g



Plot 2 System Performance Check at 835 MHz Body TSL

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d020

Date: 2/27/2018

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.96 \text{ mho/m}$; $\epsilon_r = 54.2$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature: 22.3°C Liquid Temperature: 21.5°C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(10.40, 10.40, 10.40); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=15mm, Pin=250mW/Area Scan (41x121x1): Measurement grid: $dx=1.500 \text{ mm}$, $dy=1.500 \text{ mm}$

Maximum value of SAR (interpolated) = 2.58 mW/g

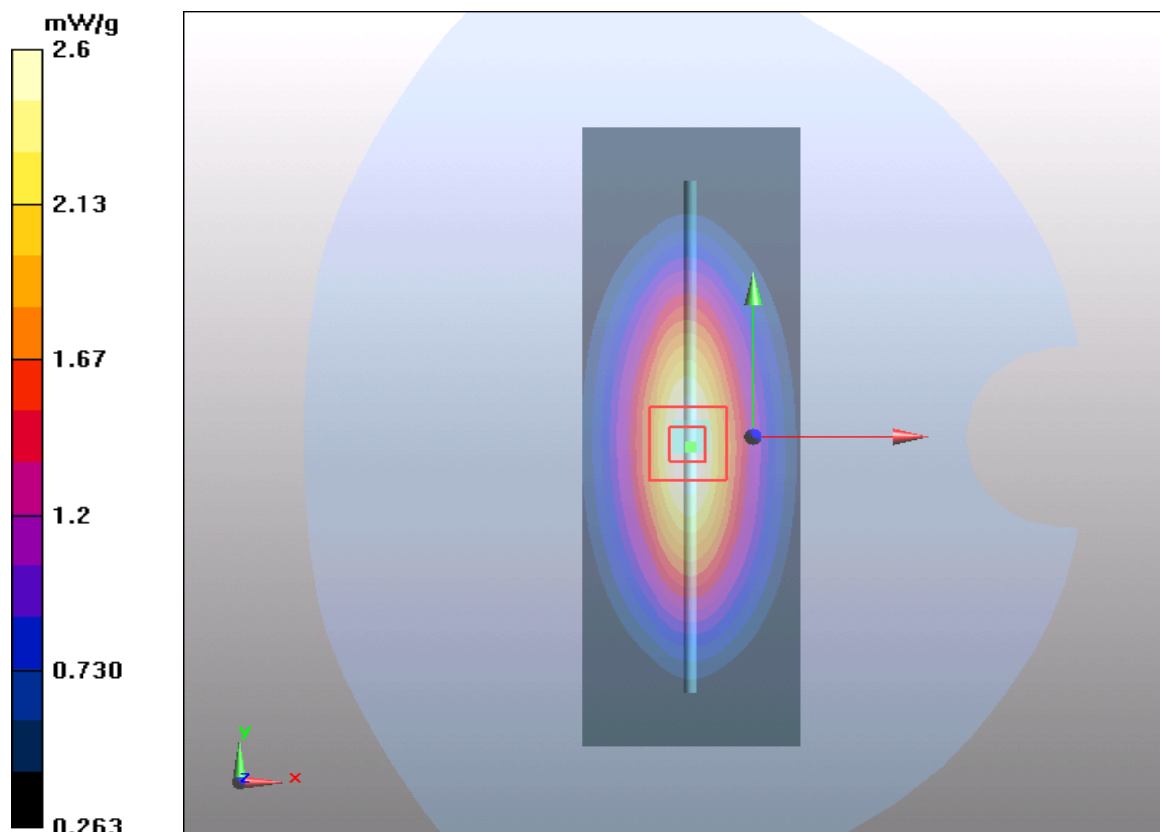
d=15mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 51.9 V/m ; Power Drift = -0.058 dB

Peak SAR (extrapolated) = 3.5 W/kg

SAR(1 g) = 2.41 mW/g ; SAR(10 g) = 1.6 mW/g

Maximum value of SAR (measured) = 2.6 mW/g



Plot 3 System Performance Check at 1900 MHz Head TSL

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d060

Date: 2/26/2018

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.41$ mho/m; $\epsilon_r = 40.1$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(8.37, 8.37, 8.37); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=10mm, Pin=250mW/Area Scan (41x71x1): Measurement grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 11.3 mW/g

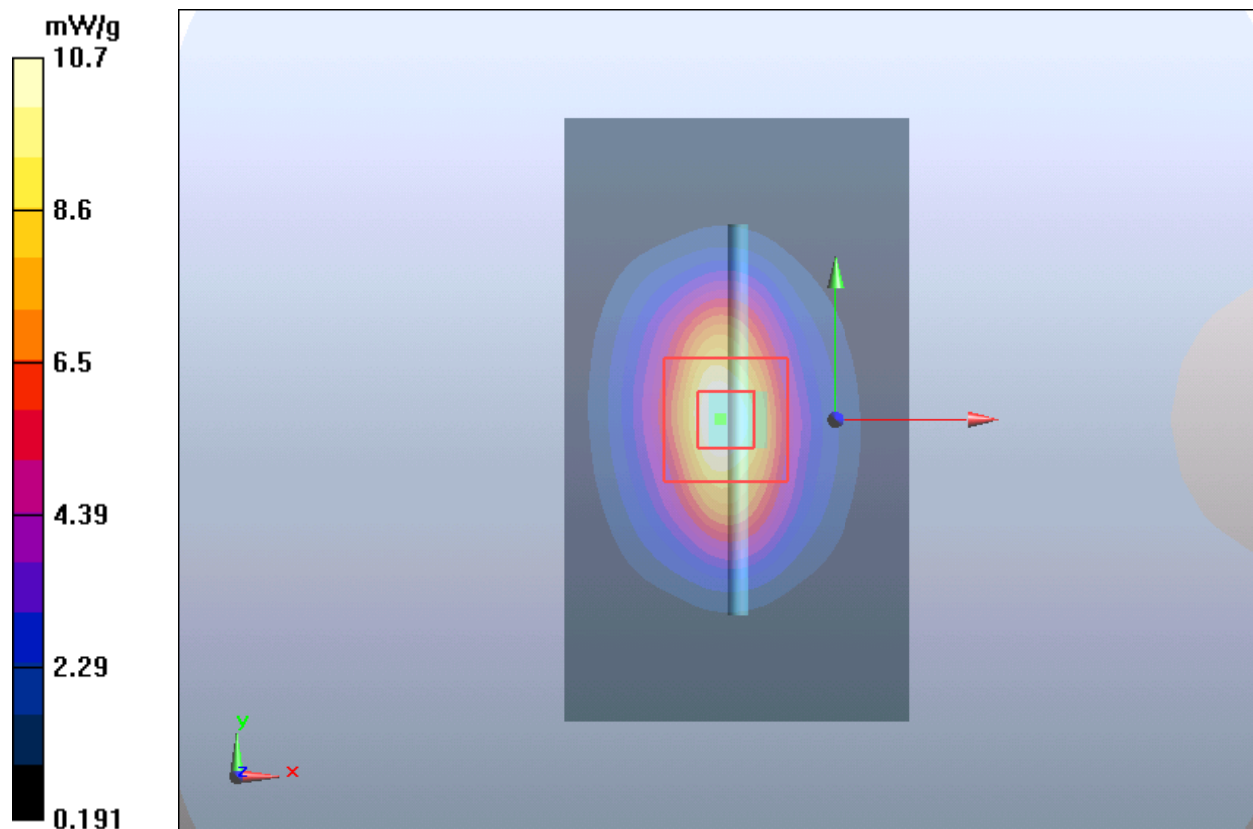
d=10mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 85.5 V/m; Power Drift = 0.028 dB

Peak SAR (extrapolated) = 17.8 W/kg

SAR(1 g) = 9.88 mW/g; SAR(10 g) = 4.9 mW/g

Maximum value of SAR (measured) = 10.7 mW/g



Plot 4 System Performance Check at 1900 MHz Body TSL

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d060

Date: 2/29/2018

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.51$ mho/m; $\epsilon_r = 52.6$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(8.17, 8.17, 8.17); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=10mm, Pin=250mW/Area Scan (41x71x1): Measurement grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 12.2 mW/g

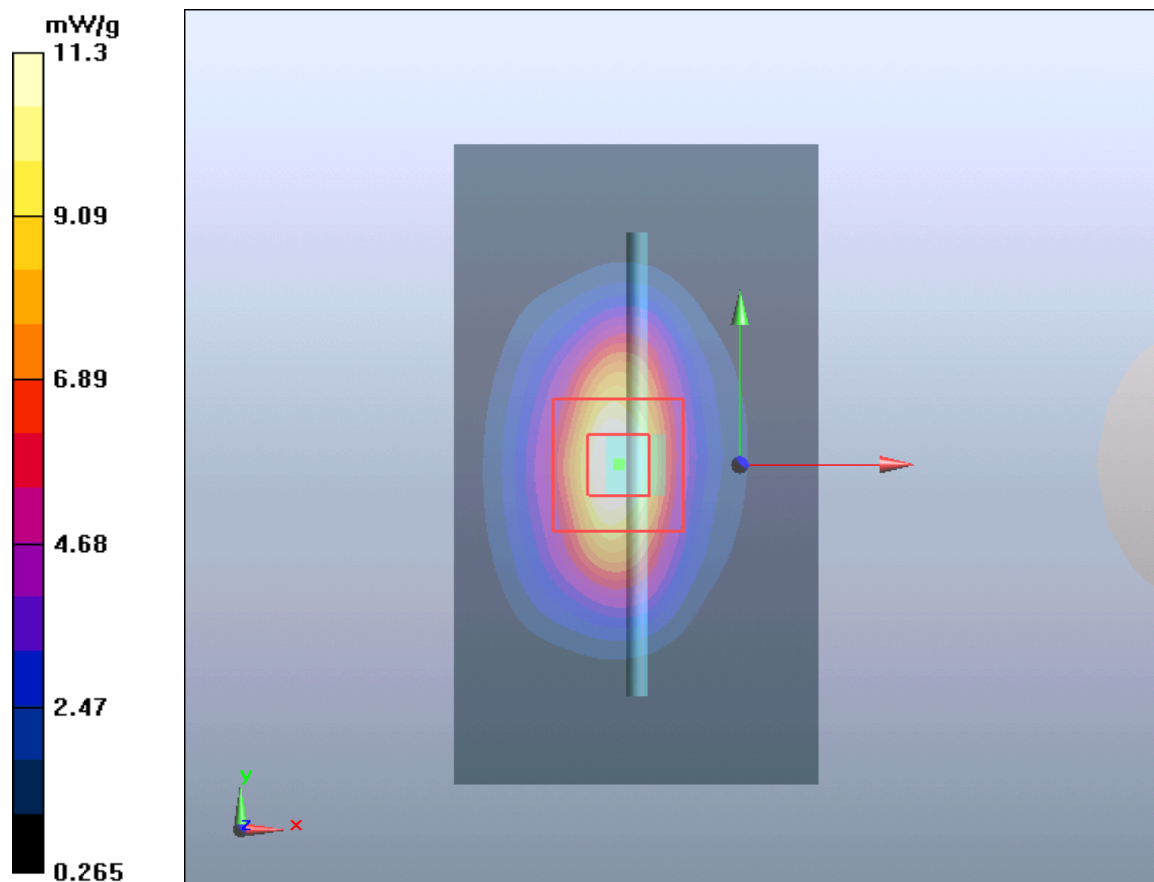
d=10mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 82.3 V/m; Power Drift = 0.068 dB

Peak SAR (extrapolated) = 17.8 W/kg

SAR(1 g) = 9.93 mW/g; SAR(10 g) = 5.25 mW/g

Maximum value of SAR (measured) = 11.3 mW/g



Plot 5 System Performance Check at 2450 MHz Head TSL

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 786

Date: 3/7/2018

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.81$ mho/m; $\epsilon_r = 38.6$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(7.55, 7.55, 7.55); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=10mm, Pin=250mW/Area Scan (41x71x1): Measurement grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 18.2 mW/g

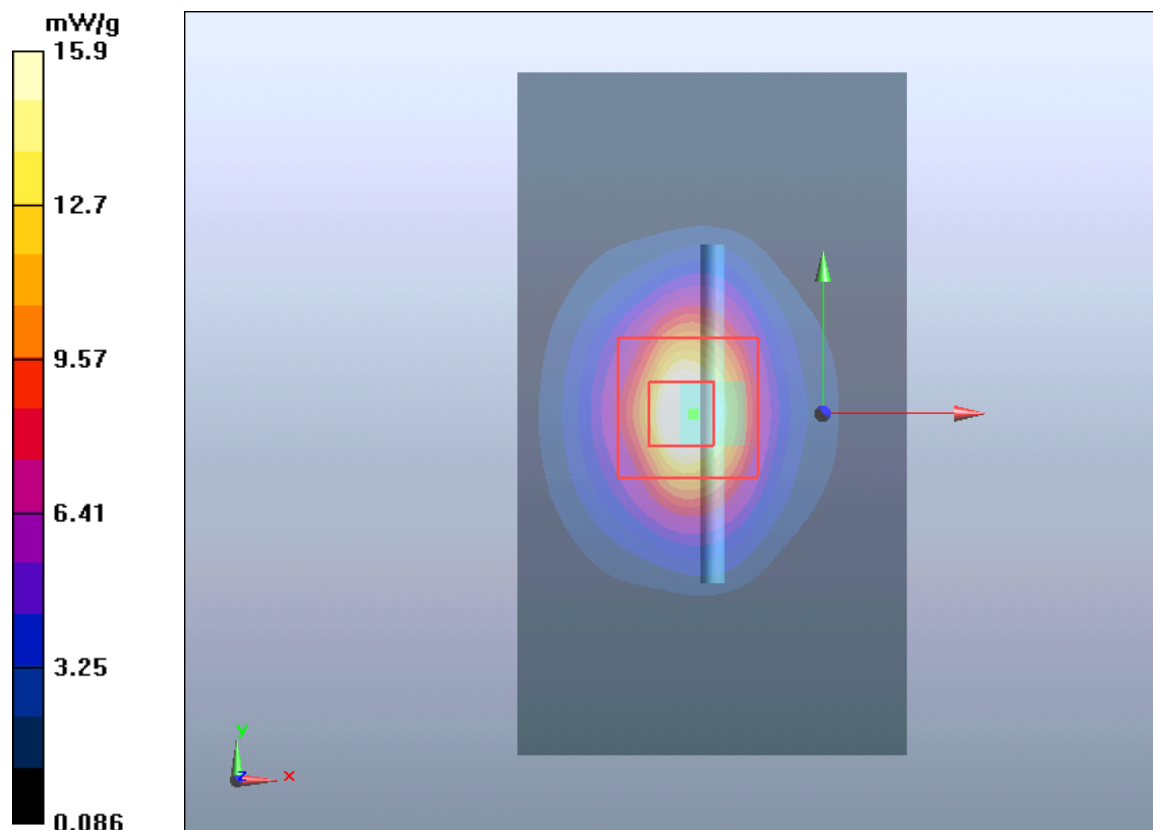
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 88.8 V/m; Power Drift = 0.075 dB

Peak SAR (extrapolated) = 30 W/kg

SAR(1 g) = 13.7 mW/g; SAR(10 g) = 6.22 mW/g

Maximum value of SAR (measured) = 15.9 mW/g



Plot 6 System Performance Check at 2450 MHz Body TSL

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 786

Date: 3/5/2018

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.98$ mho/m; $\epsilon_r = 52.5$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(7.85, 7.85, 7.85); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=10mm, Pin=250mW/Area Scan (41x71x1): Measurement grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 16 mW/g

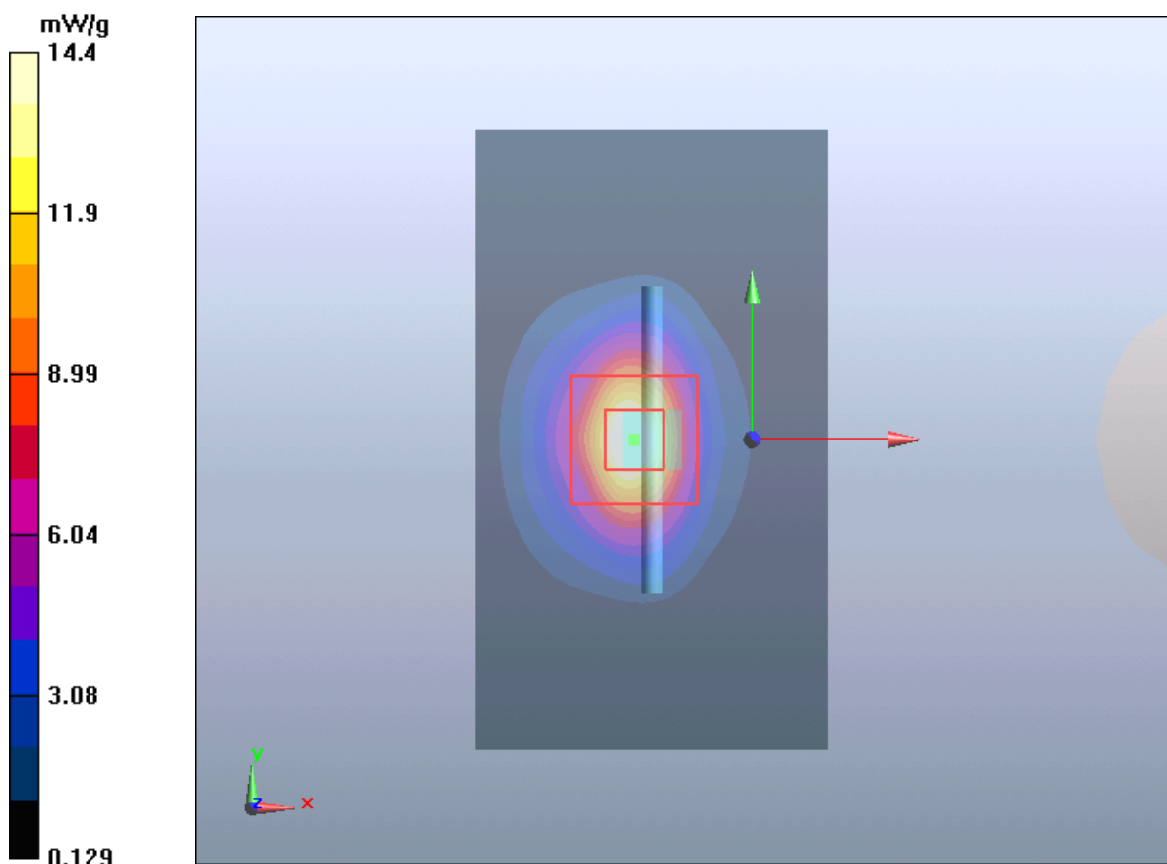
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 81.2 V/m; Power Drift = 0.003 dB

Peak SAR (extrapolated) = 25.4 W/kg

SAR(1 g) = 12.5 mW/g; SAR(10 g) = 6.20 mW/g

Maximum value of SAR (measured) = 14.4 mW/g



Plot 7 System Performance Check at 2600 MHz Head TSL

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1058

Date: 2/28/2018

Communication System: CW; Frequency: 2600 MHz

Medium parameters used: $f = 2600$ MHz; $\sigma = 2.01$ mho/m; $\epsilon_r = 38.2$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(7.37, 7.37, 7.37); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=10mm, Pin=250mW/Area Scan (41x71x1): Measurement grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 17.439 mW/g

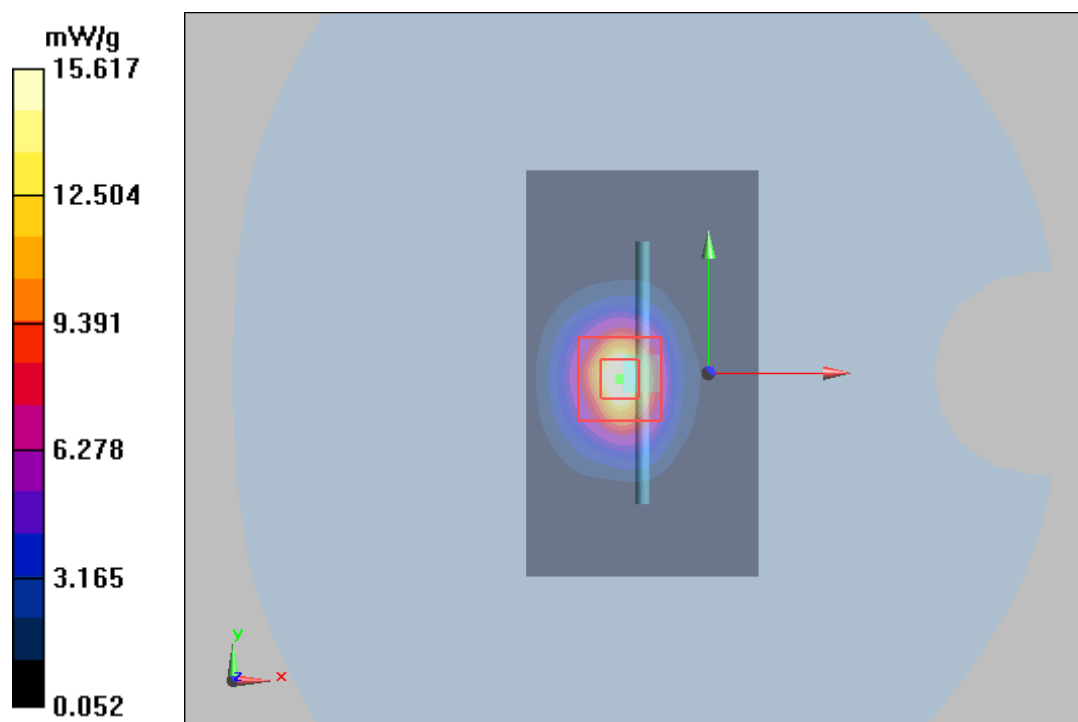
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 87.998 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 31.858 W/kg

SAR(1 g) = 13.9 mW/g; SAR(10 g) = 6.07 mW/g

Maximum value of SAR (measured) = 15.617 mW/g



Plot 8 System Performance Check at 2600 MHz Body TSL

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1058

Date: 2/28/2018

Communication System: CW; Frequency: 2600 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2600$ MHz; $\sigma = 2.23$ mho/m; $\epsilon_r = 51.5$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(7.51, 7.51, 7.51); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

d=10mm, Pin=250mW /Area Scan (41x71x1): Measurement grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 17.7 mW/g

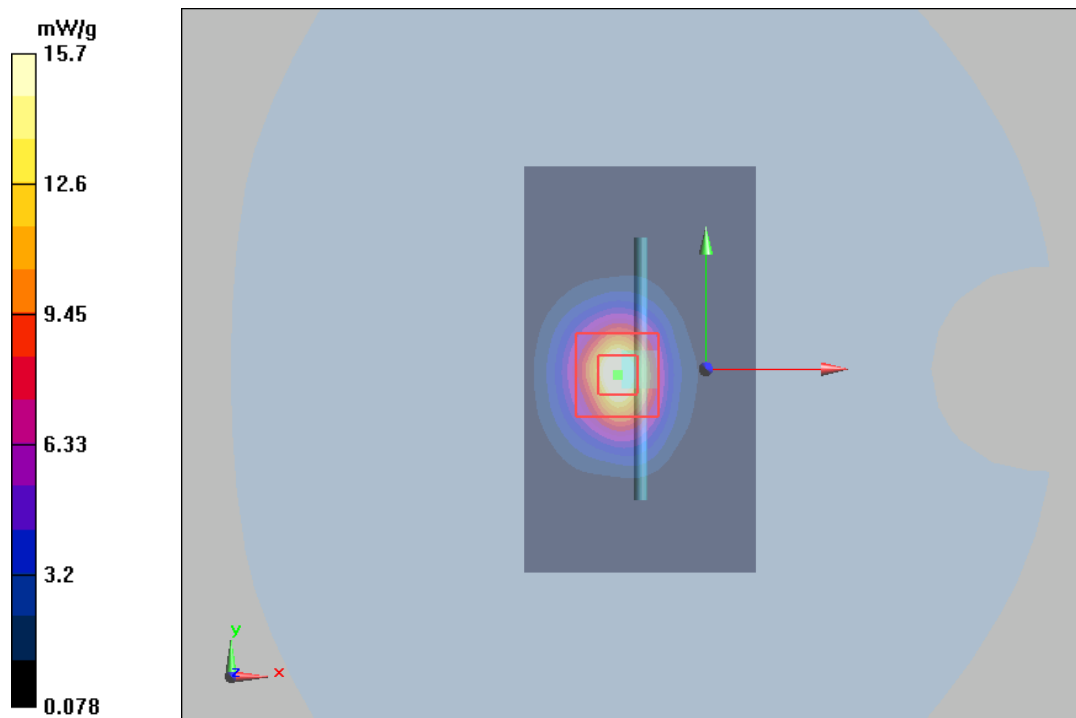
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 74 V/m; Power Drift = -0.0027 dB

Peak SAR (extrapolated) = 28.5 W/kg

SAR(1 g) = 13.5 mW/g; SAR(10 g) = 5.99 mW/g

Maximum value of SAR (measured) = 15.7 mW/g



ANNEX C: Highest Graph Results

Plot 9 GSM 850 Right Cheek Middle

Date: 2/26/2018

Communication System: UID 0, GSM (0); Frequency: 836.6 MHz; Duty Cycle: 1:8.30042

Medium parameters used: $f = 837$ MHz; $\sigma = 0.923$ S/m; $\epsilon_r = 41.229$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Right Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(10.23, 10.23, 10.23); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Right Cheek Middle/Area Scan (71x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.217 W/kg

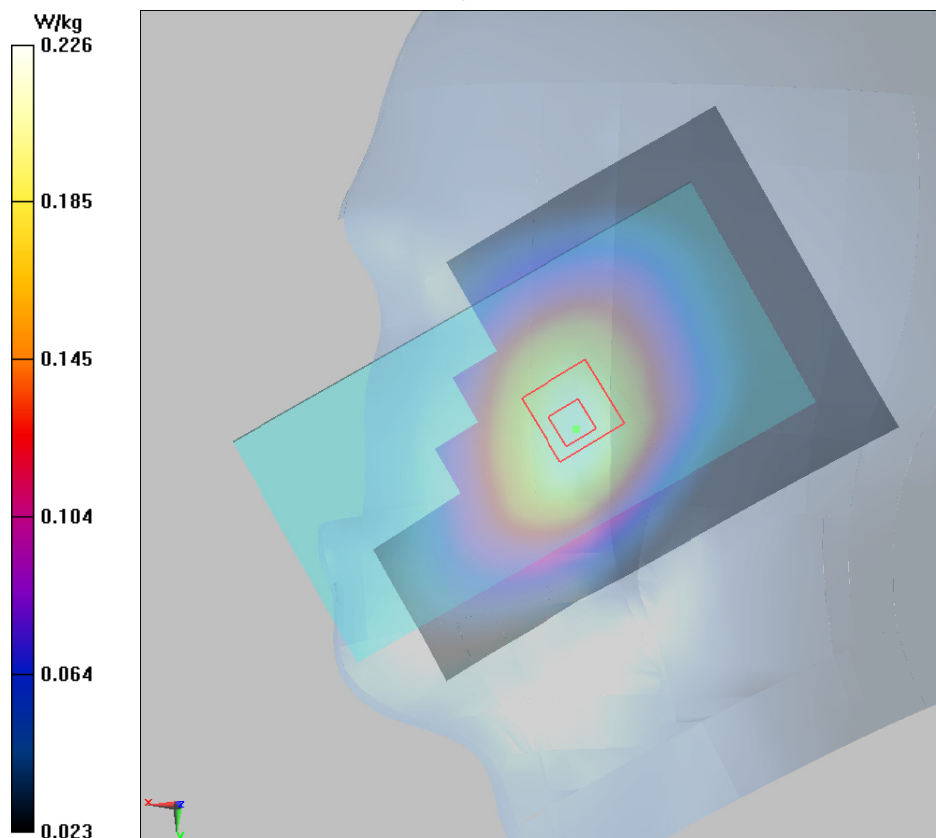
Right Cheek Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.717 V/m; Power Drift = -0.045 dB

Peak SAR (extrapolated) = 0.261 W/kg

SAR(1 g) = 0.211 W/kg; SAR(10 g) = 0.157 W/kg

Maximum value of SAR (measured) = 0.226 W/kg



Plot 10 GSM 850 Back Side Middle (Distance 15mm)

Date: 2/27/2018

Communication System: UID 0, GSM (0); Frequency: 836.6 MHz; Duty Cycle: 1:8.30042

Medium parameters used: $f = 837$ MHz; $\sigma = 1.013$ S/m; $\epsilon_r = 55.395$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(10.40, 10.40, 10.40); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side Middle/Area Scan (71x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.274 W/kg

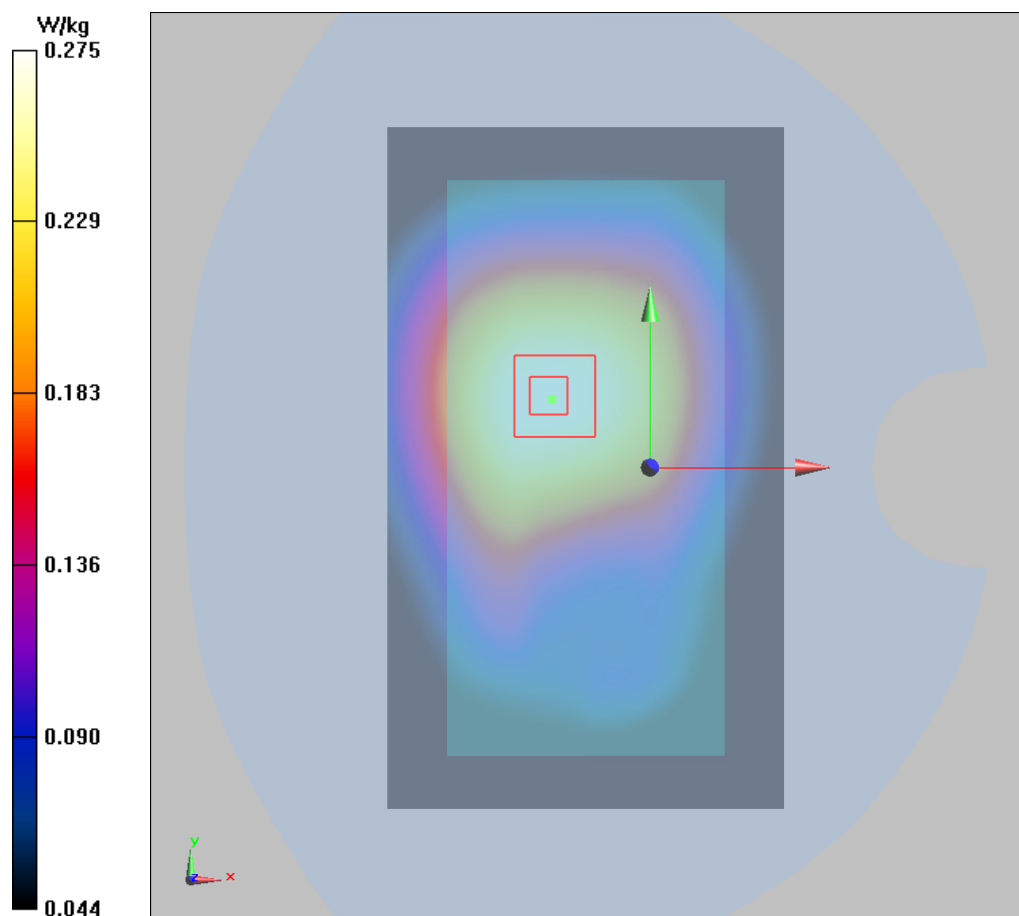
Back Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 15.25 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.325 W/kg

SAR(1 g) = 0.261 W/kg; SAR(10 g) = 0.199 W/kg

Maximum value of SAR (measured) = 0.275 W/kg



Plot 11 GSM 850 GPRS (1Txslot) Back Side Middle (Distance 10mm)

Date: 2/27/2018

Communication System: UID 0, 1 slot GPRS (0); Frequency: 836.6 MHz; Duty Cycle: 1:8.30042

Medium parameters used: $f = 837$ MHz; $\sigma = 1.013$ S/m; $\epsilon_r = 55.395$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(10.40, 10.40, 10.40); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side Middle/Area Scan (71x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.276 W/kg

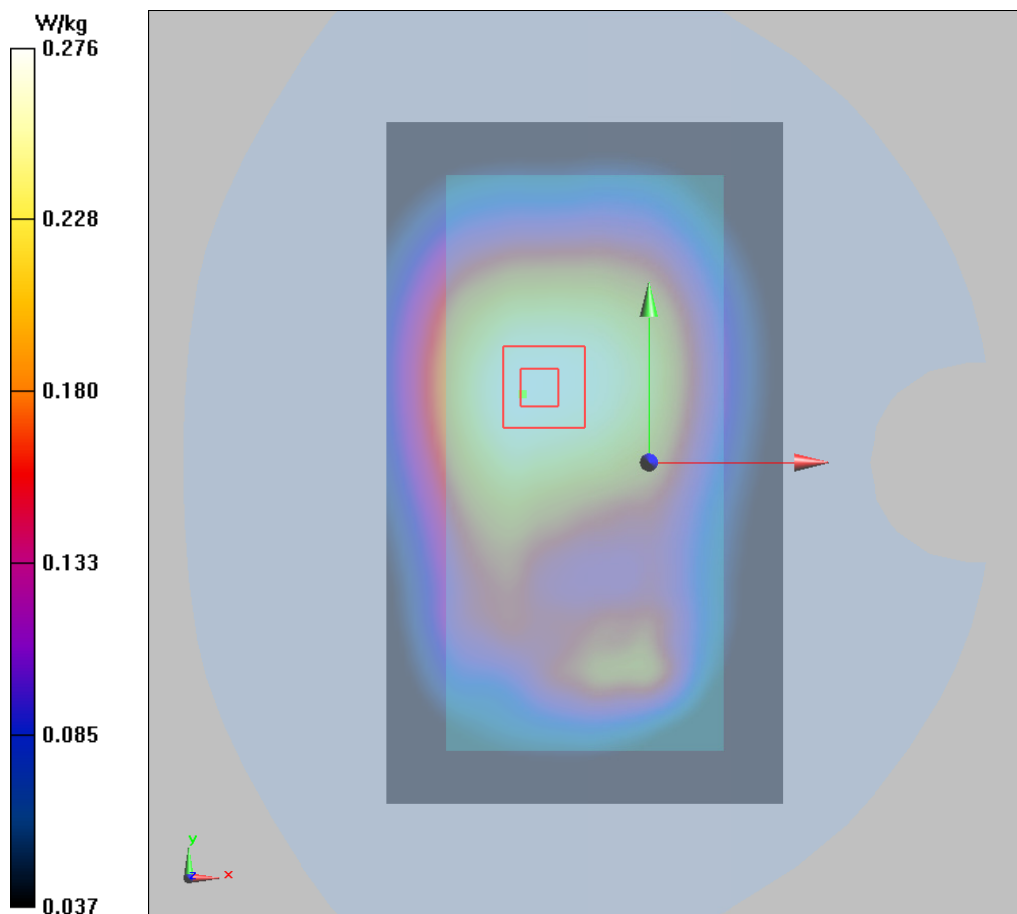
Back Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 15.06 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 0.328 W/kg

SAR(1 g) = 0.264 W/kg; SAR(10 g) = 0.202 W/kg

Maximum value of SAR (measured) = 0.276 W/kg



Plot 12 GSM 1900 Left Cheek Middle

Date: 2/26/2018

Communication System: UID 0, GSM (0); Frequency: 1880 MHz; Duty Cycle: 1:8.30042

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.364$ S/m; $\epsilon_r = 40.415$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(8.37, 8.37, 8.37); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Left Cheek Middle/Area Scan (71x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.174 W/kg

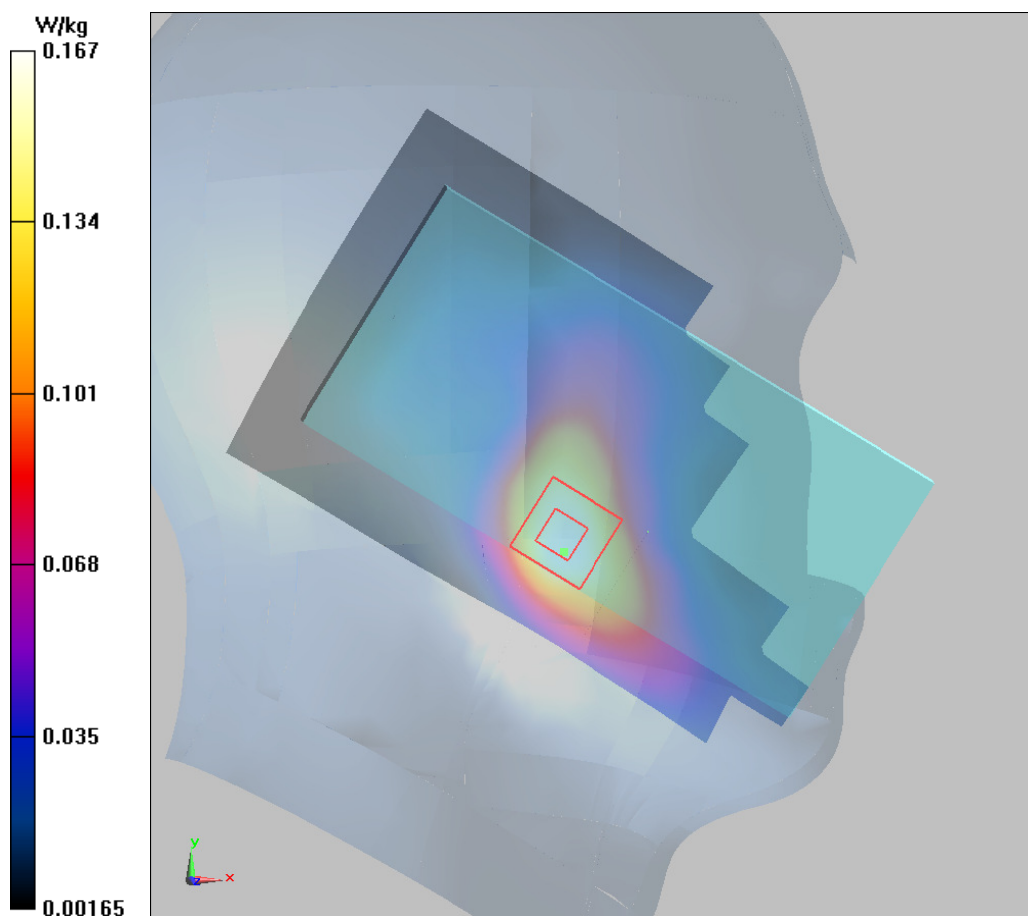
Left Cheek Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 3.473 V/m; Power Drift = -0.079 dB

Peak SAR (extrapolated) = 0.245 W/kg

SAR(1 g) = 0.157 W/kg; SAR(10 g) = 0.097 W/kg

Maximum value of SAR (measured) = 0.167 W/kg



Plot 13 GSM 1900 Back Side Middle (Distance 15mm)

Date: 2/29/2018

Communication System: UID 0, GSM (0); Frequency: 1880 MHz; Duty Cycle: 1:8.30042

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.475$ S/m; $\epsilon_r = 51.872$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(8.17, 8.17, 8.17); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side Middle/Area Scan (71x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.183 W/kg

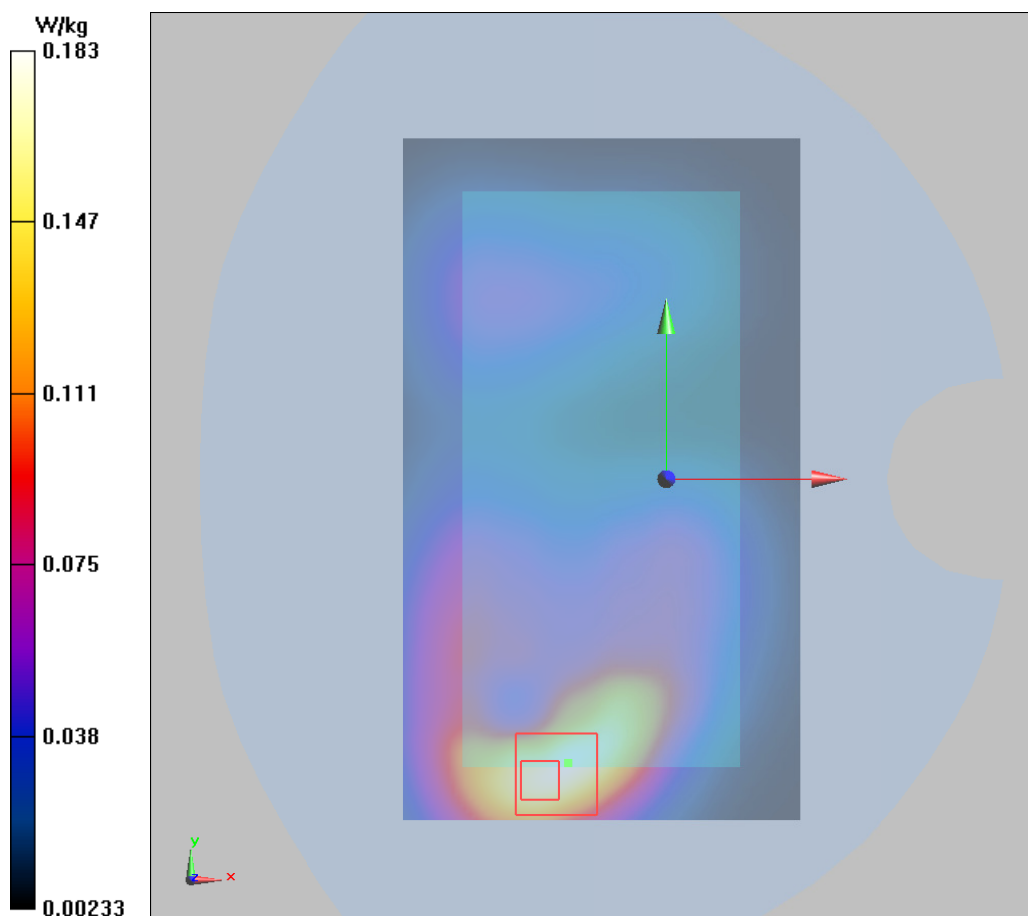
Back Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 3.959 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 0.277 W/kg

SAR(1 g) = 0.170 W/kg; SAR(10 g) = 0.098 W/kg

Maximum value of SAR (measured) = 0.183 W/kg



Plot 14 GSM 1900 GPRS (1Txslot) Bottom Edge Middle (Distance 10mm)

Date: 2/29/2018

Communication System: UID 0, 1 slot GPRS (0); Frequency: 1880 MHz; Duty Cycle: 1:8.30042

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.475$ S/m; $\epsilon_r = 51.872$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(8.17, 8.17, 8.17); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Bottom Edge Middle/Area Scan (31x71x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.630 W/kg

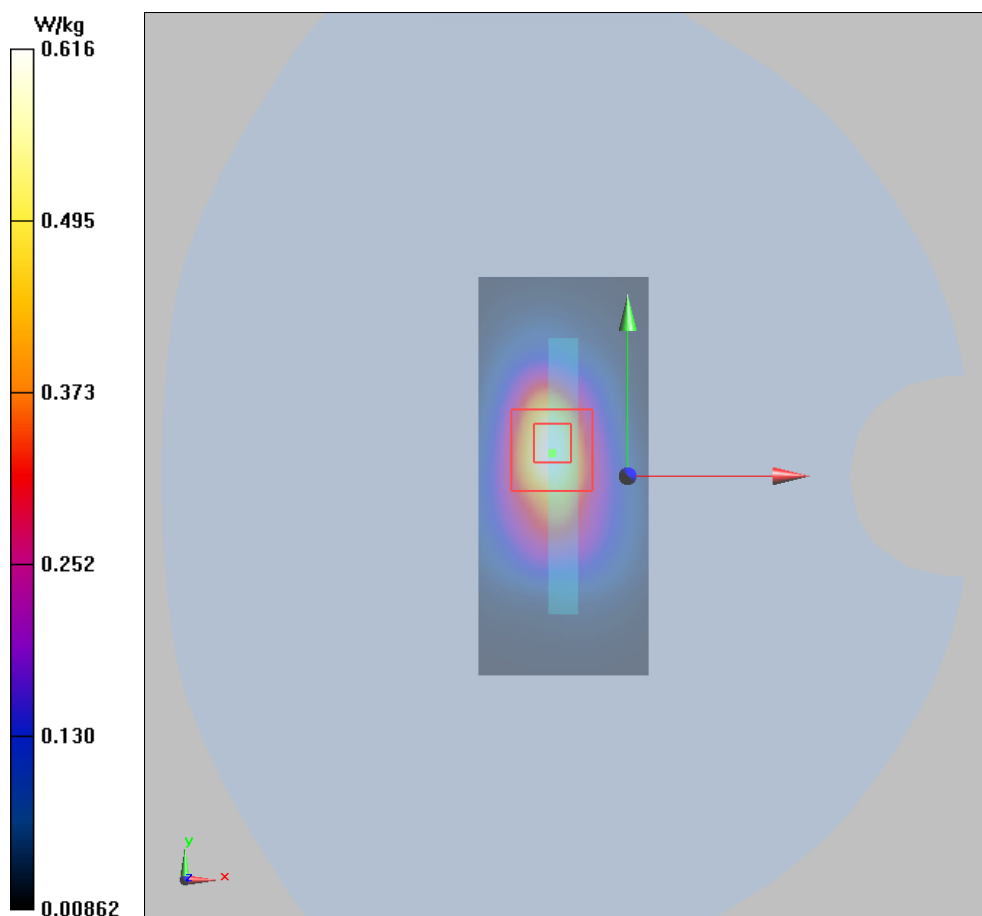
Bottom Edge Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 18.75 V/m; Power Drift = 0.15 dB

Peak SAR (extrapolated) = 0.985 W/kg

SAR(1 g) = 0.561 W/kg; SAR(10 g) = 0.290 W/kg

Maximum value of SAR (measured) = 0.616 W/kg



Plot 15 UMTS Band II Left Cheek Middle

Date: 2/26/2018

Communication System: UID 0, WCDMA (0); Frequency: 1880 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.364$ S/m; $\epsilon_r = 40.415$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(8.37, 8.37, 8.37); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Left Cheek Middle/Area Scan (71x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.349 W/kg

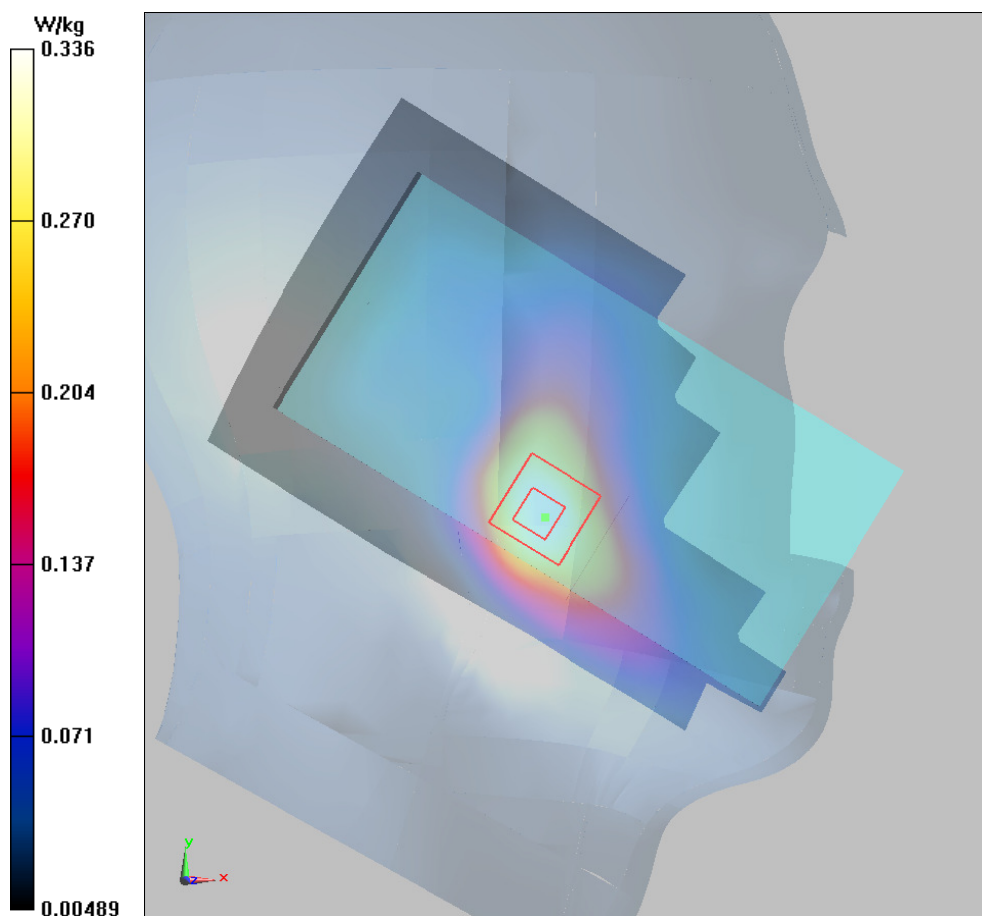
Left Cheek Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 4.554 V/m; Power Drift = 0.12 dB

Peak SAR (extrapolated) = 0.488 W/kg

SAR(1 g) = 0.313 W/kg; SAR(10 g) = 0.195 W/kg

Maximum value of SAR (measured) = 0.336 W/kg



Plot 16 UMTS Band II Back Side Middle (Distance 15mm)

Date: 2/29/2018

Communication System: UID 0, WCDMA (0); Frequency: 1880 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.475$ S/m; $\epsilon_r = 51.872$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(8.17, 8.17, 8.17); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side Middle/Area Scan (71x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.257 W/kg

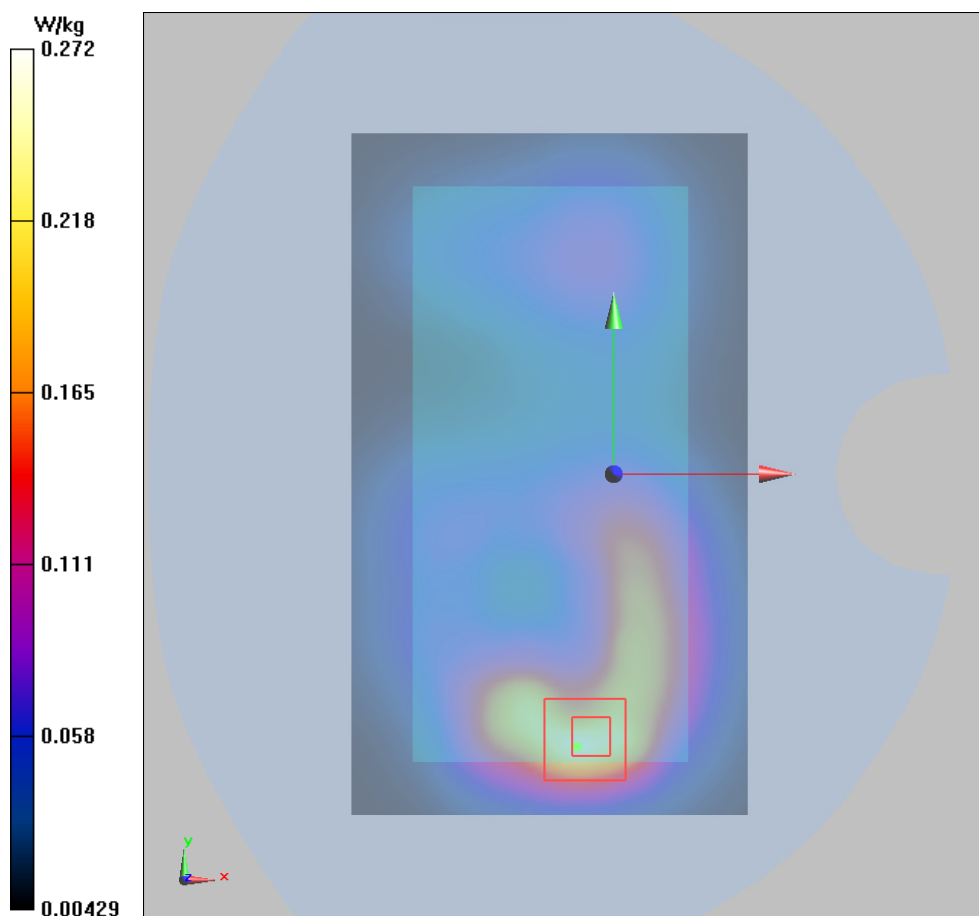
Back Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 6.396 V/m; Power Drift = 0.19 dB

Peak SAR (extrapolated) = 0.417 W/kg

SAR(1 g) = 0.255 W/kg; SAR(10 g) = 0.141 W/kg

Maximum value of SAR (measured) = 0.272 W/kg



Plot 17 UMTS Band II Bottom Edge Middle (Distance 10mm)

Date: 2/29/2018

Communication System: UID 0, WCDMA (0); Frequency: 1880 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.475$ S/m; $\epsilon_r = 51.872$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(8.17, 8.17, 8.17); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Bottom Edge Middle/Area Scan (31x71x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.682 W/kg

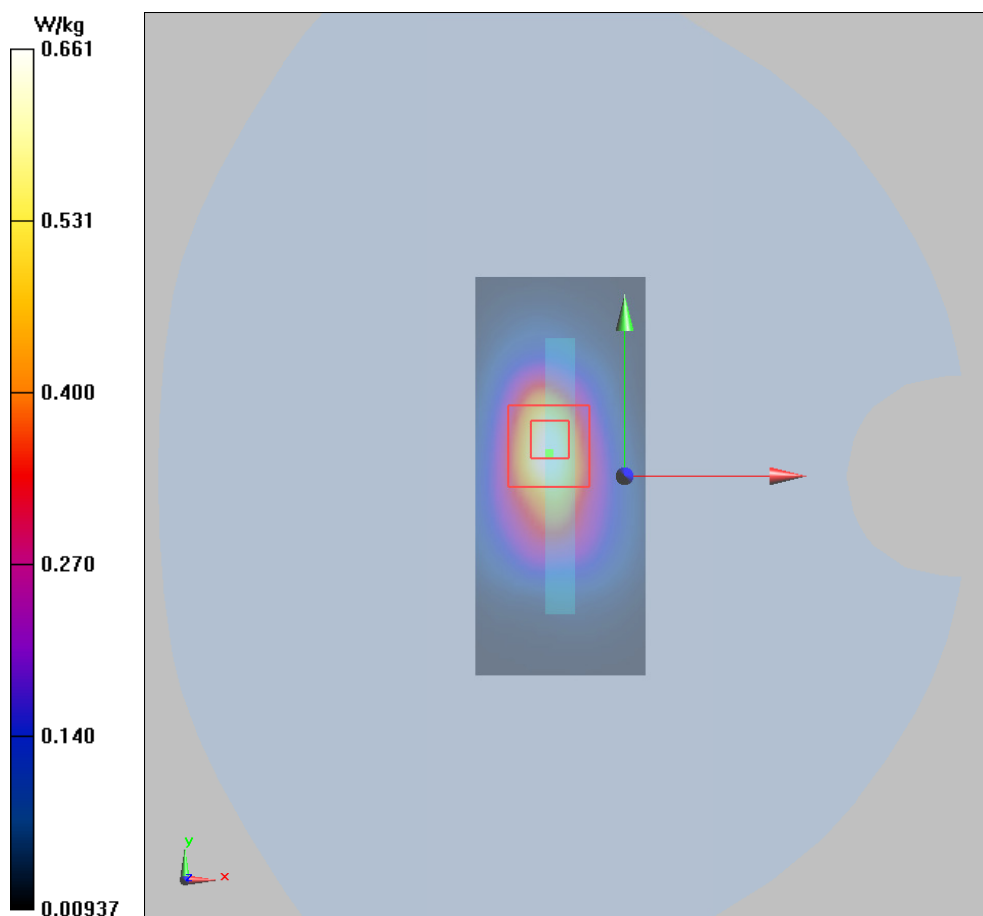
Bottom Edge Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 19.43 V/m; Power Drift = 0.033 dB

Peak SAR (extrapolated) = 1.06 W/kg

SAR(1 g) = 0.601 W/kg; SAR(10 g) = 0.308 W/kg

Maximum value of SAR (measured) = 0.661 W/kg



Plot 18 UMTS Band V Right Cheek Middle

Date: 2/26/2018

Communication System: UID 0, WCDMA (0); Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 837$ MHz; $\sigma = 0.923$ S/m; $\epsilon_r = 41.229$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Right Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(10.23, 10.23, 10.23); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Right Cheek Middle/Area Scan (71x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.302 W/kg

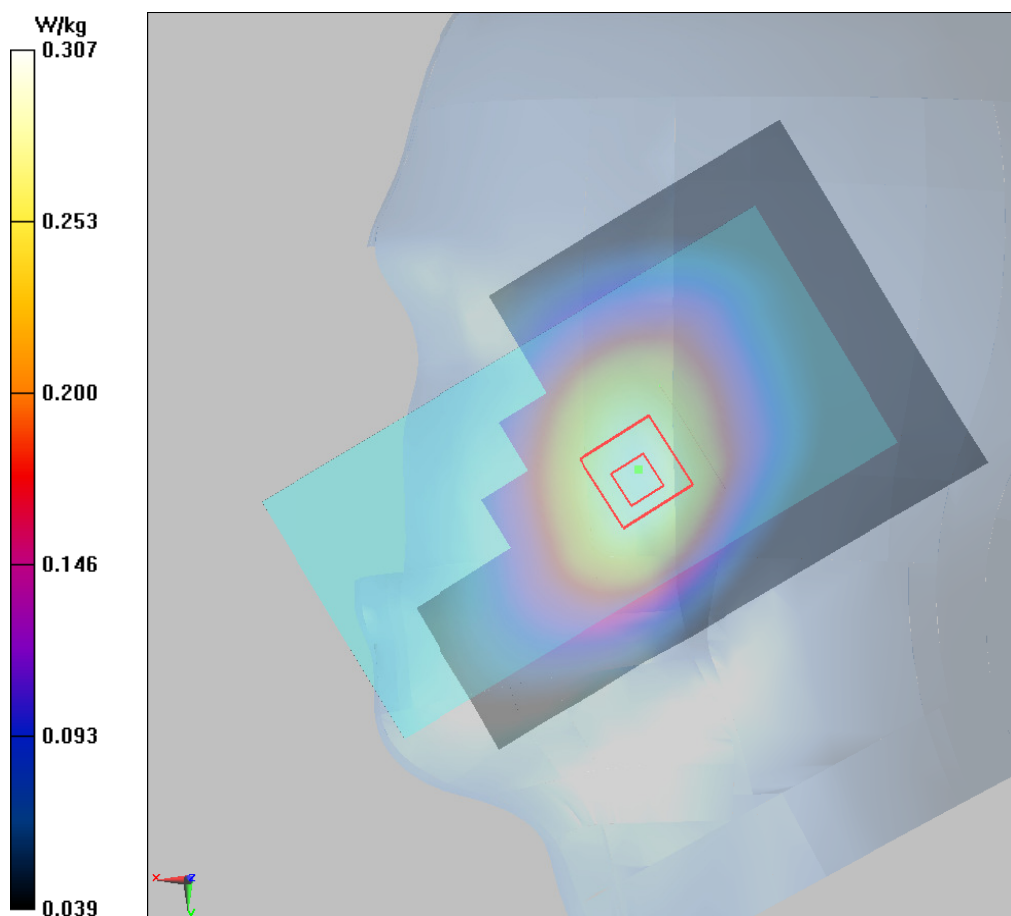
Right Cheek Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 6.726 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.355 W/kg

SAR(1 g) = 0.290 W/kg; SAR(10 g) = 0.220 W/kg

Maximum value of SAR (measured) = 0.307 W/kg



Plot 19 UMTS Band V Back Side Middle (Distance 15mm)

Date: 2/27/2018

Communication System: UID 0, WCDMA (0); Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 837$ MHz; $\sigma = 1.013$ S/m; $\epsilon_r = 55.395$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(10.40, 10.40, 10.40); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side Middle/Area Scan (71x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.376 W/kg

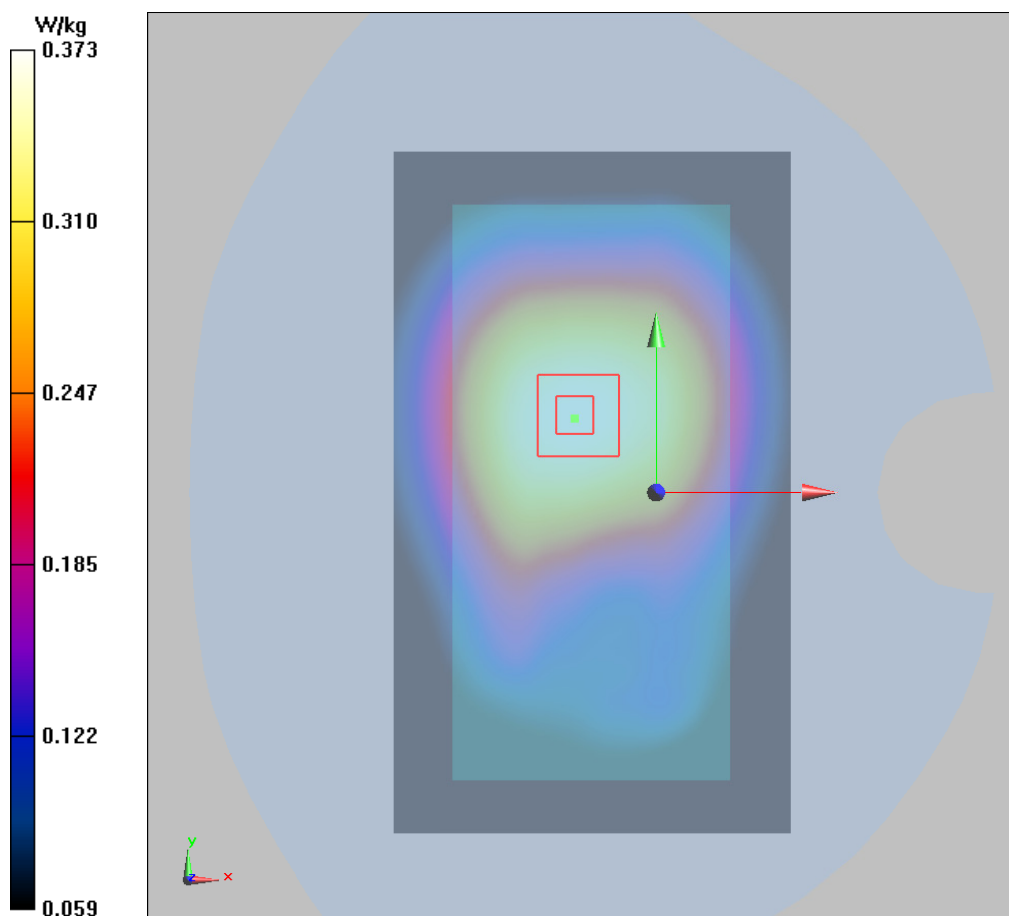
Back Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 17.70 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.442 W/kg

SAR(1 g) = 0.356 W/kg; SAR(10 g) = 0.271 W/kg

Maximum value of SAR (measured) = 0.373 W/kg



Plot 20 UMTS Band V Back Side Middle (Distance 10mm)

Date: 2/27/2018

Communication System: UID 0, WCDMA (0); Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 837$ MHz; $\sigma = 1.013$ S/m; $\epsilon_r = 55.395$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(10.40, 10.40, 10.40); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side Middle/Area Scan (71x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.401 W/kg

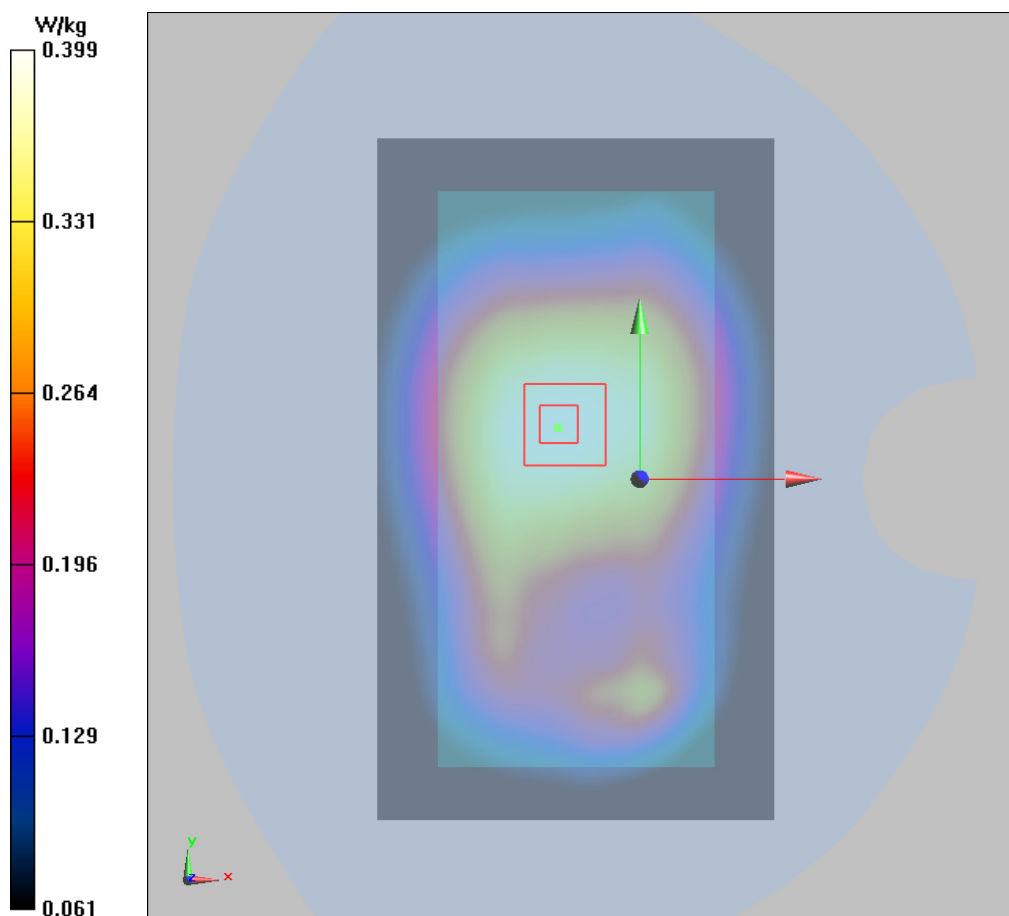
Back Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 19.30 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.470 W/kg

SAR(1 g) = 0.381 W/kg; SAR(10 g) = 0.293 W/kg

Maximum value of SAR (measured) = 0.399 W/kg



Plot 21 LTE Band 5 1RB Right Cheek Middle

Date: 2/26/2018

Communication System: UID 0, LTE_FDD (0); Frequency: 852 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 852$ MHz; $\sigma = 0.936$ S/m; $\epsilon_r = 41.056$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Right Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(10.23, 10.23, 10.23); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Right Cheek Middle/Area Scan (71x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.255 W/kg

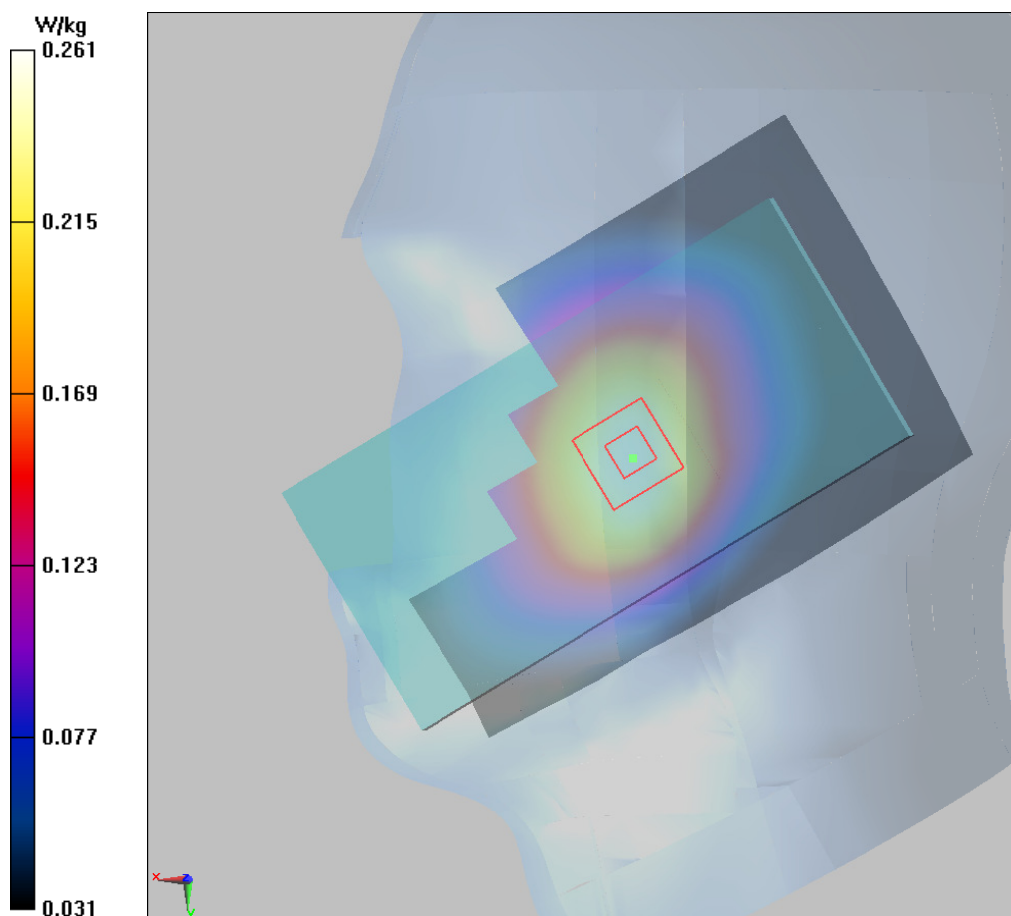
Right Cheek Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 6.609 V/m; Power Drift = 0.15 dB

Peak SAR (extrapolated) = 0.307 W/kg

SAR(1 g) = 0.247 W/kg; SAR(10 g) = 0.185 W/kg

Maximum value of SAR (measured) = 0.261 W/kg



Plot 22 LTE Band 5 1RB Back Side Middle (Distance 15mm)

Date: 2/27/2018

Communication System: UID 0, LTE_FDD (0); Frequency: 836.5 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 836.5$ MHz; $\sigma = 1.013$ S/m; $\epsilon_r = 55.404$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(10.40, 10.40, 10.40); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side Middle/Area Scan (71x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.254 W/kg

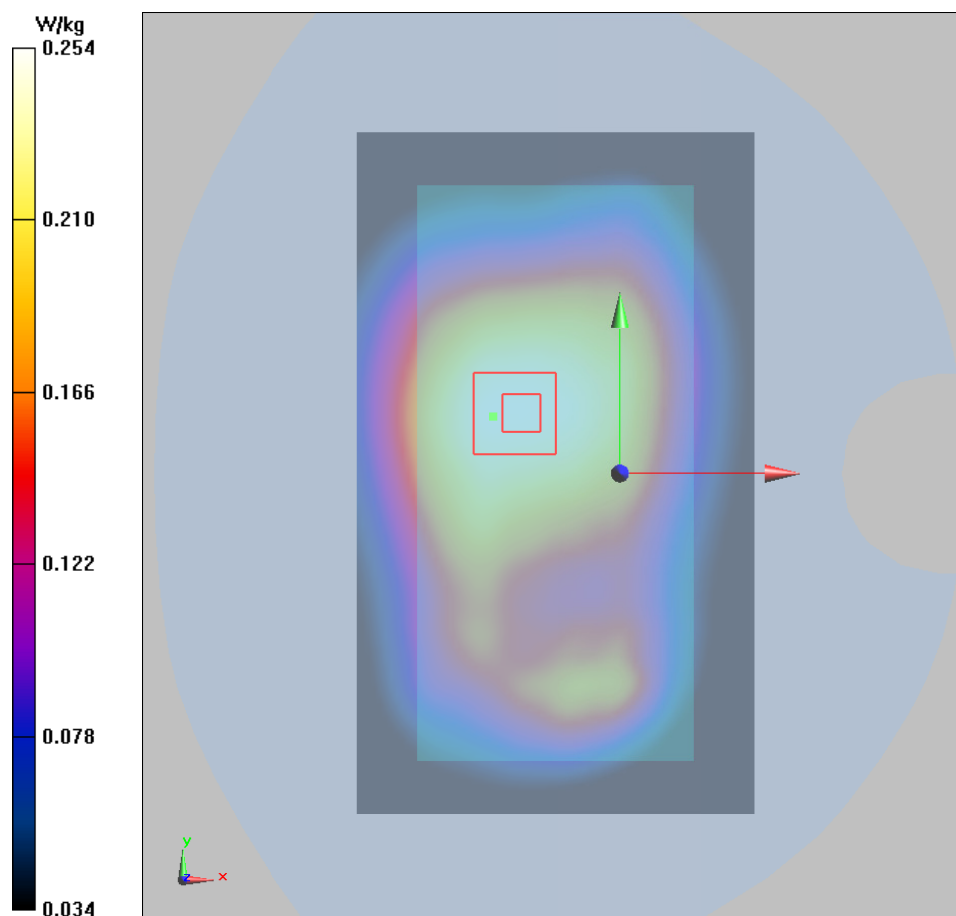
Back Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 15.00 V/m; Power Drift = 0.15 dB

Peak SAR (extrapolated) = 0.310 W/kg

SAR(1 g) = 0.243 W/kg; SAR(10 g) = 0.187 W/kg

Maximum value of SAR (measured) = 0.254 W/kg



Plot 23 LTE Band 5 1RB Back Side Middle (Distance 10mm)

Date: 2/27/2018

Communication System: UID 0, LTE_FDD (0); Frequency: 836.5 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 836.5$ MHz; $\sigma = 1.013$ S/m; $\epsilon_r = 55.404$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(10.40, 10.40, 10.40); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side Middle/Area Scan (71x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.310 W/kg

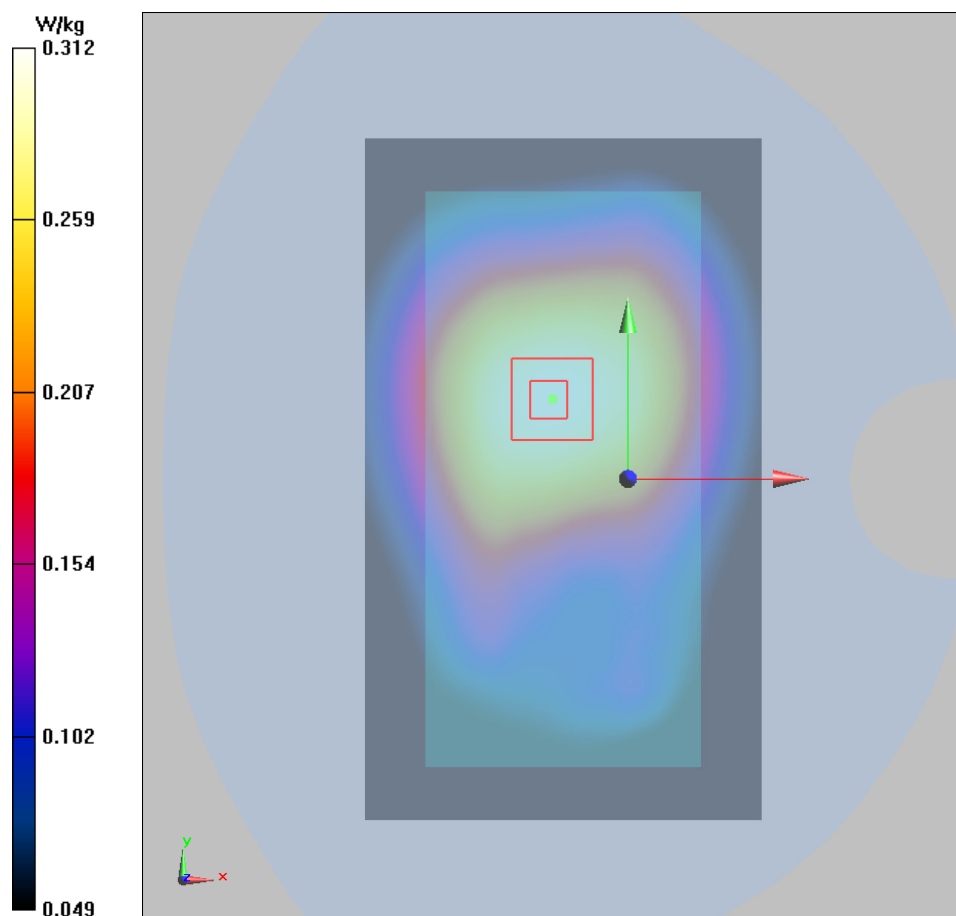
Back Side Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 16.15 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.368 W/kg

SAR(1 g) = 0.297 W/kg; SAR(10 g) = 0.227 W/kg

Maximum value of SAR (measured) = 0.312 W/kg



Plot 24 LTE Band 7 1RB Right Cheek High

Date: 2/28/2018

Communication System: UID 0, LTE_FDD (0); Frequency: 2560 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2560$ MHz; $\sigma = 1.944$ S/m; $\epsilon_r = 38.953$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(7.37, 7.37, 7.37); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Left Cheek High/Area Scan (91x151x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 0.146 W/kg

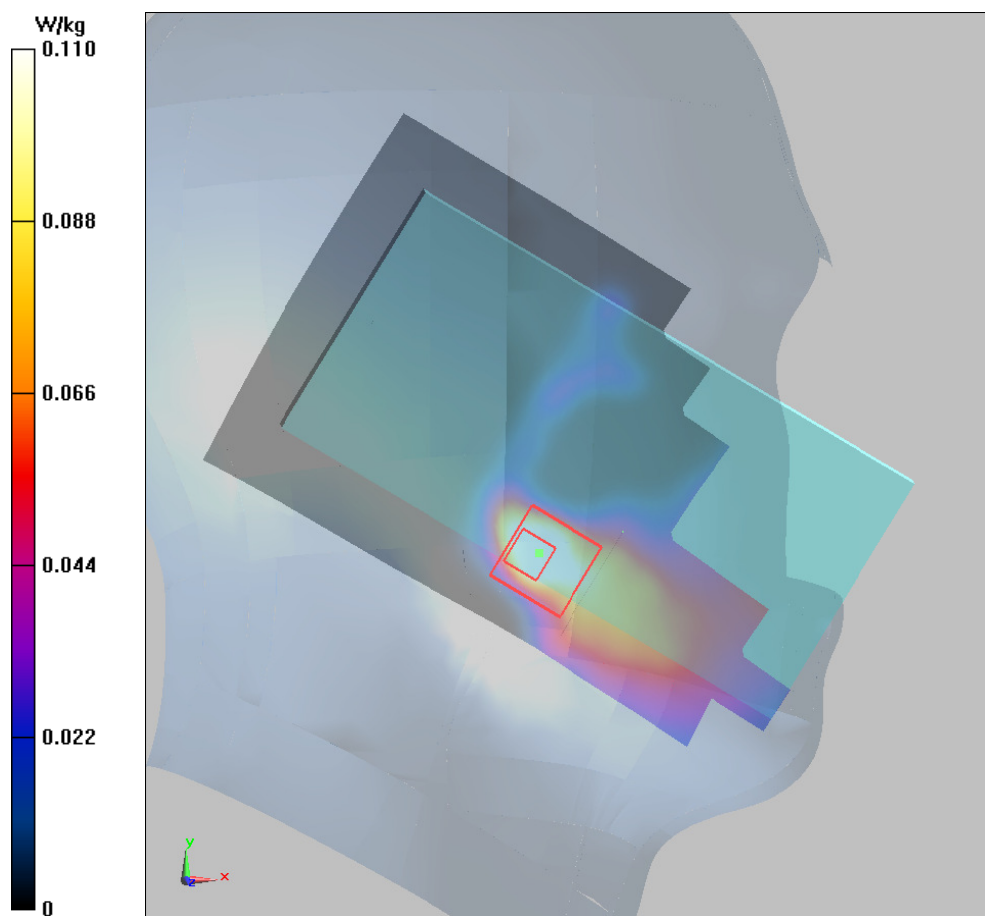
Left Cheek High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 0.9440 V/m; Power Drift = 0.061 dB

Peak SAR (extrapolated) = 0.204 W/kg

SAR(1 g) = 0.109 W/kg; SAR(10 g) = 0.079 W/kg

Maximum value of SAR (measured) = 0.110 W/kg



Plot 25 LTE Band 7 1RB Back Side High (Distance 15mm)

Date: 2/28/2018

Communication System: UID 0, LTE_FDD (0); Frequency: 2560 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2560$ MHz; $\sigma = 2.077$ S/m; $\epsilon_r = 52.374$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(7.51, 7.51, 7.51); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side High/Area Scan (91x151x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 0.281 W/kg

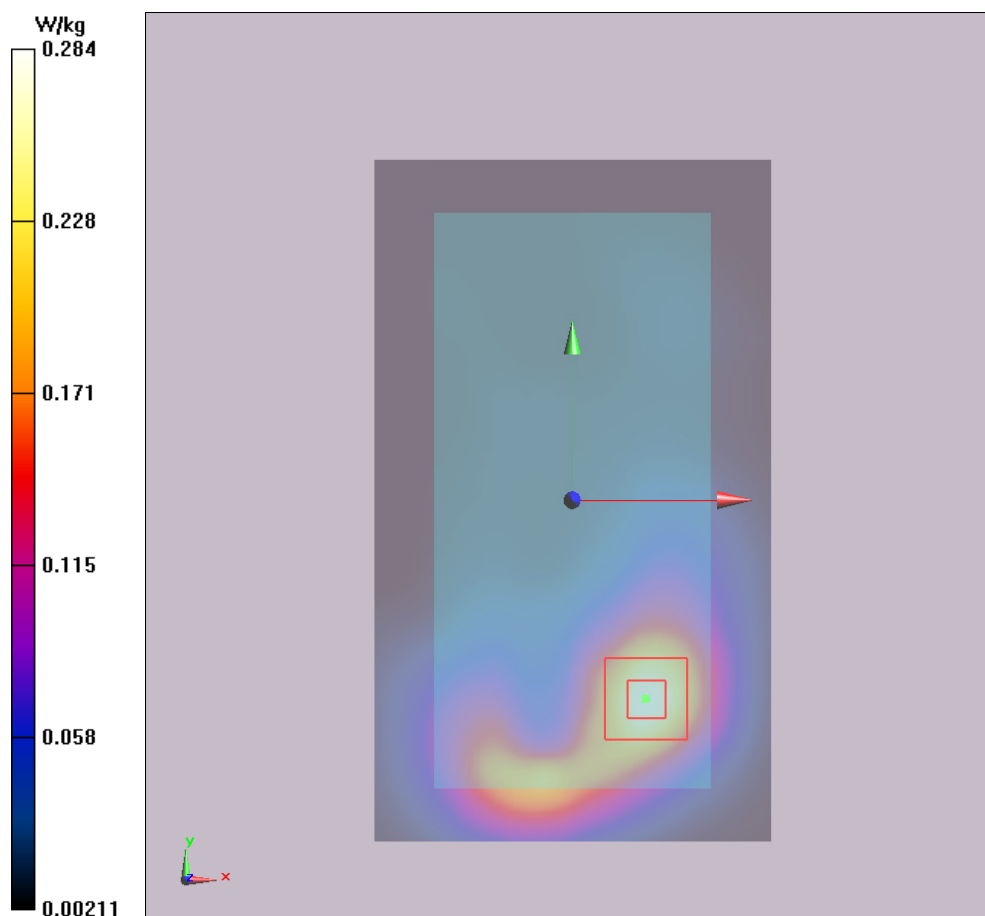
Back Side High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 2.910 V/m; Power Drift = -0.101 dB

Peak SAR (extrapolated) = 0.490 W/kg

SAR(1 g) = 0.257 W/kg; SAR(10 g) = 0.135 W/kg

Maximum value of SAR (measured) = 0.284 W/kg



Plot 26 LTE Band 7 50%RB Bottom Edge High (Distance 10mm)

Date: 2/28/2018

Communication System: UID 0, LTE_FDD (0); Frequency: 2510 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2510$ MHz; $\sigma = 2.017$ S/m; $\epsilon_r = 52.518$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(7.51, 7.51, 7.51); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Bottom Edge Low/Area Scan (51x111x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.609 W/kg

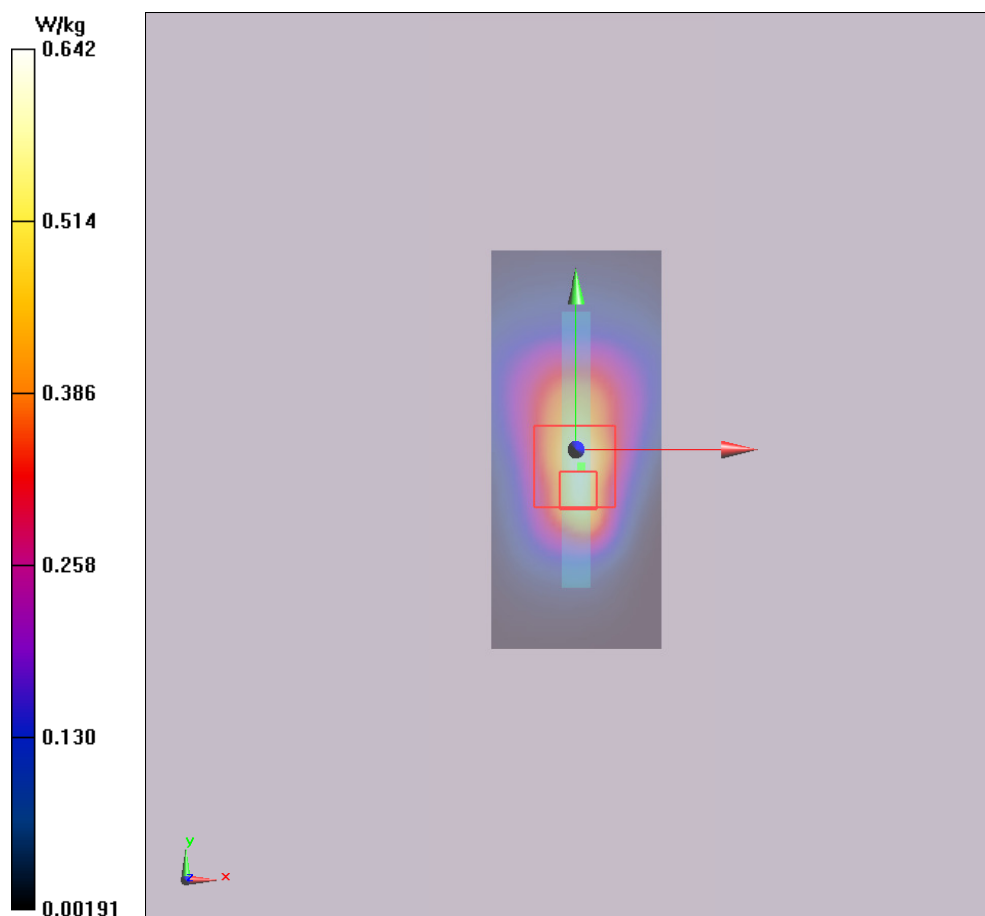
Bottom Edge Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 16.78 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 1.21 W/kg

SAR(1 g) = 0.554 W/kg; SAR(10 g) = 0.257 W/kg

Maximum value of SAR (measured) = 0.642 W/kg



Plot 27 802.11b Left Cheek High (WiFi data standalone)

Date: 3/7/2018

Communication System: UID 0, WiFi (0); Frequency: 2462 MHz; Duty Cycle: 1:1.023

Medium parameters used: $f = 2462$ MHz; $\sigma = 1.87$ S/m; $\epsilon_r = 39.707$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(7.55, 7.55, 7.55); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Left Cheek High/Area Scan (91x151x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 1.13 W/kg

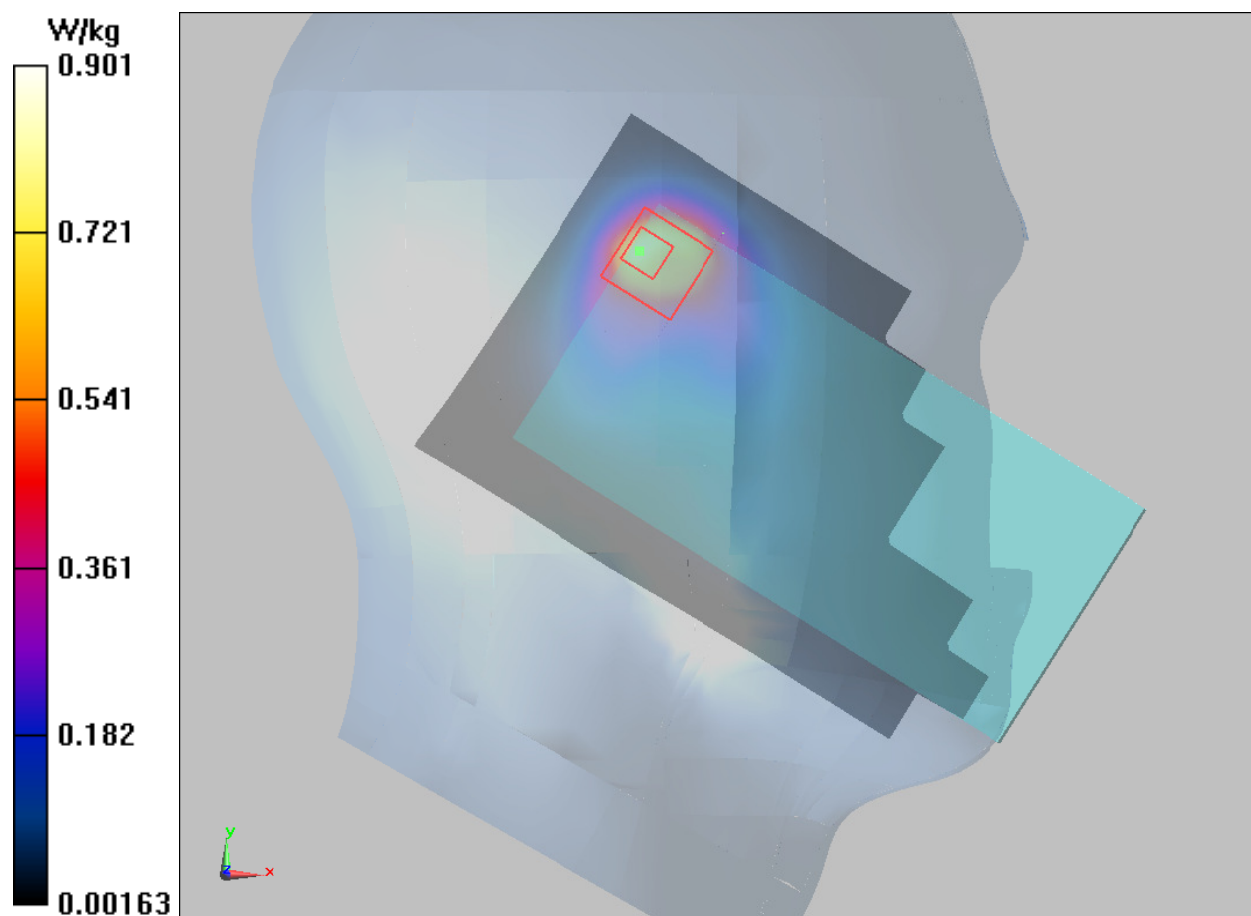
Left Cheek High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 14.95 V/m; Power Drift = 0.096 dB

Peak SAR (extrapolated) = 1.82 W/kg

SAR(1 g) = 0.772 W/kg; SAR(10 g) = 0.346 W/kg

Maximum value of SAR (measured) = 0.901 W/kg



Plot 28 802.11b Back Side Middle (WIFI data standalone, Distance 15mm)

Date: 3/5/2018

Communication System: UID 0, WiFi (0); Frequency: 2437 MHz; Duty Cycle: 1:1.023

Medium parameters used: $f = 2437$ MHz; $\sigma = 1.929$ S/m; $\epsilon_r = 52.727$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(7.85, 7.85, 7.85); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side Middle/Area Scan (91x151x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 0.110 W/kg

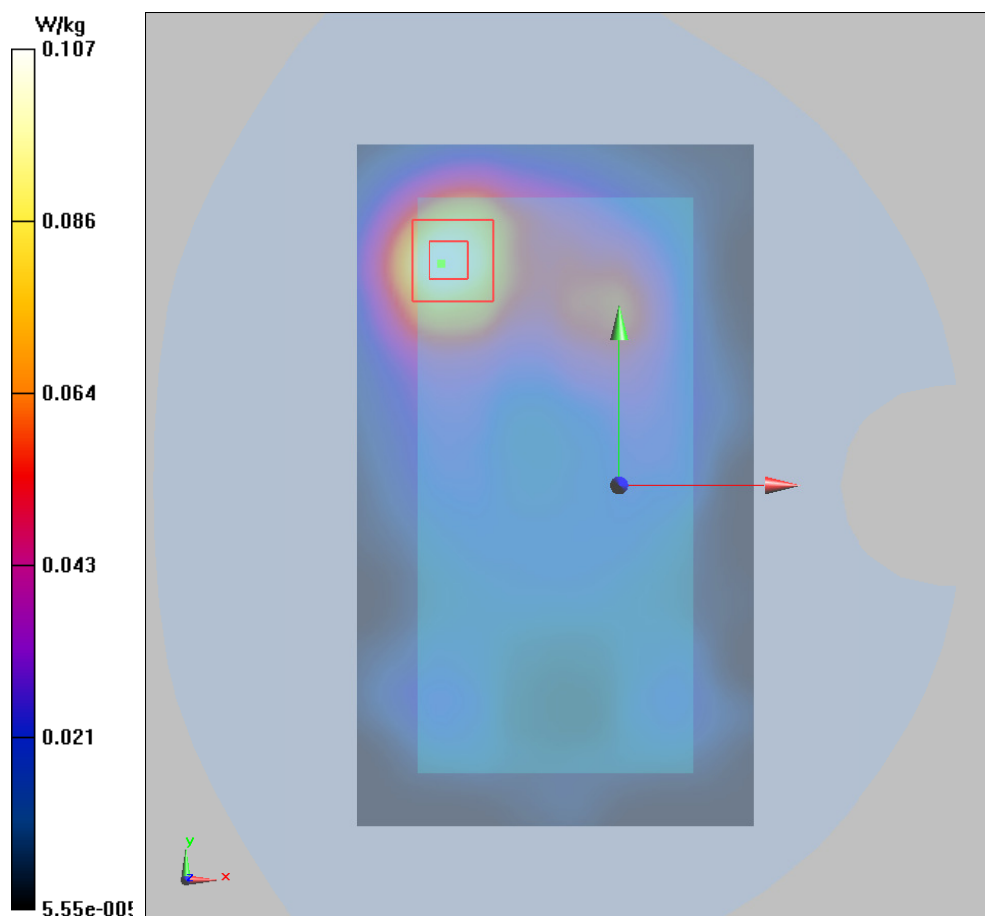
Back Side Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 2.797 V/m; Power Drift = 0.031 dB

Peak SAR (extrapolated) = 0.189 W/kg

SAR(1 g) = 0.099 W/kg; SAR(10 g) = 0.053 W/kg

Maximum value of SAR (measured) = 0.107 W/kg



Plot 29 802.11b Back Side Middle (WIFI data standalone, Distance 10mm)

Date: 3/5/2018

Communication System: UID 0, WiFi (0); Frequency: 2437 MHz; Duty Cycle: 1:1.023

Medium parameters used: $f = 2437$ MHz; $\sigma = 1.929$ S/m; $\epsilon_r = 52.727$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Flat Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(7.85, 7.85, 7.85); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Back Side Middle/Area Scan (91x151x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 0.212 W/kg

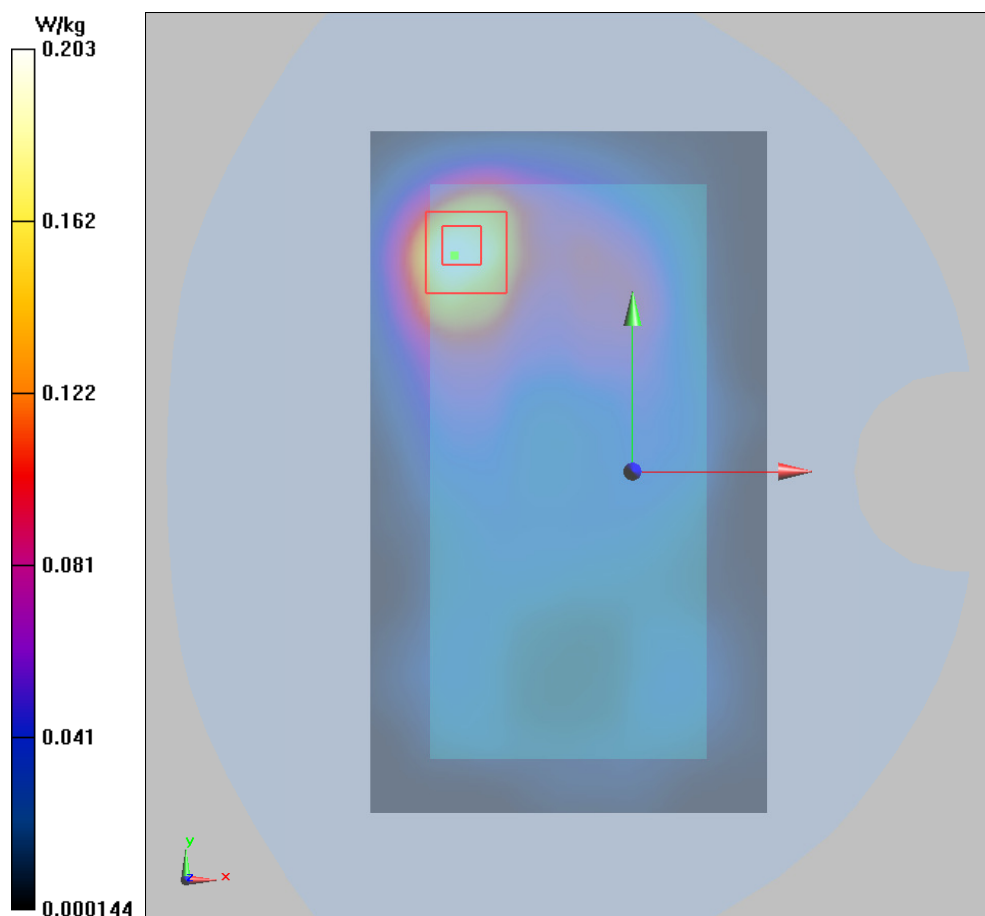
Back Side Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 4.267 V/m; Power Drift = -0.070 dB

Peak SAR (extrapolated) = 0.378 W/kg

SAR(1 g) = 0.191 W/kg; SAR(10 g) = 0.100 W/kg

Maximum value of SAR (measured) = 0.203 W/kg



Plot 30 802.11n HT40 Left Cheek High (Sensor on)

Date: 3/7/2018

Communication System: UID 0, WiFi (0); Frequency: 2437 MHz; Duty Cycle: 1:1.300

Medium parameters used: $f = 2437$ MHz; $\sigma = 1.841$ S/m; $\epsilon_r = 39.795$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(7.55, 7.55, 7.55); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Left Cheek High/Area Scan (91x151x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 0.568 W/kg

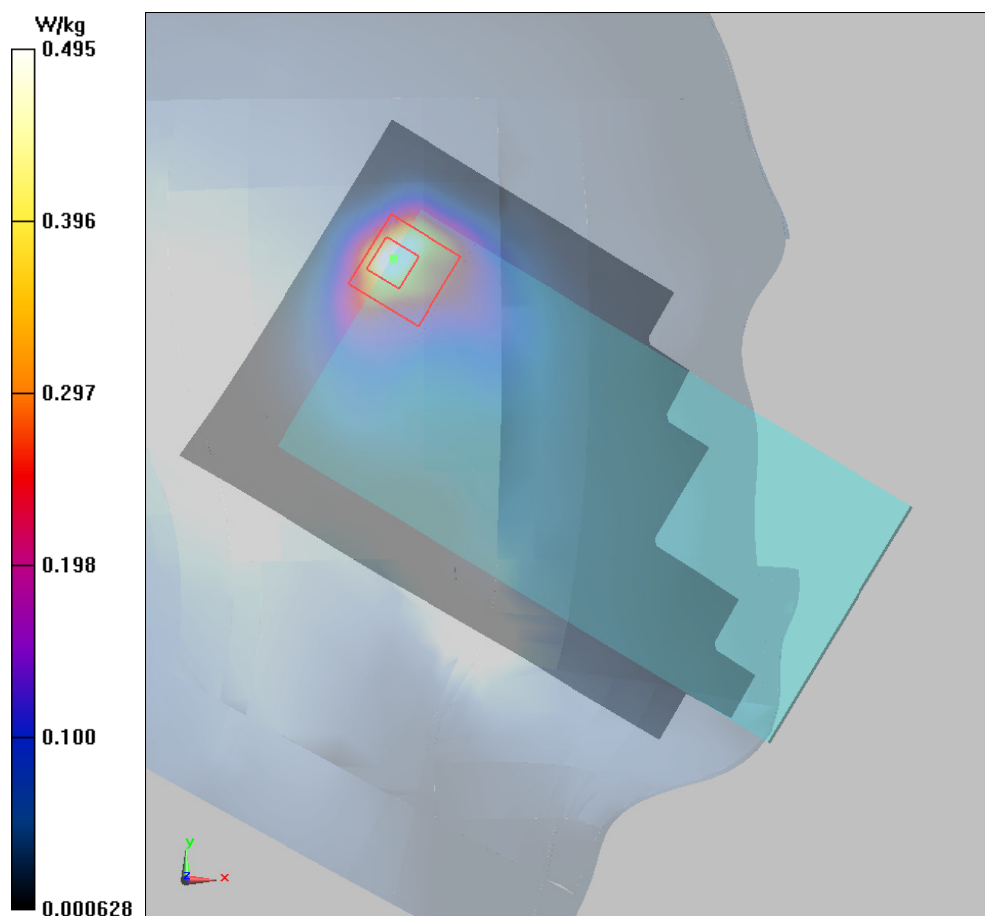
Left Cheek High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 9.691 V/m; Power Drift = 0.024 dB

Peak SAR (extrapolated) = 1.03 W/kg

SAR(1 g) = 0.424 W/kg; SAR(10 g) = 0.189 W/kg

Maximum value of SAR (measured) = 0.495 W/kg



Plot 31 BT Left Cheek Middle

Date: 3/7/2018

Communication System: UID 0, WiFi (0); Frequency: 2437 MHz; Duty Cycle: 1:1.300

Medium parameters used: $f = 2437$ MHz; $\sigma = 1.841$ S/m; $\epsilon_r = 39.795$; $\rho = 1000$ kg/m³

Ambient Temperature: 22.3 °C Liquid Temperature: 21.5 °C

Phantom section: Left Section

DASY5 Configuration:

Sensor-Surface: 4mm (Mechanical Surface Detection)

Probe: EX3DV4 - SN3898; ConvF(7.55, 7.55, 7.55); Calibrated: 6/27/2017;

Electronics: DAE4 Sn1291; Calibrated: 10/31/2017

Phantom: SAM1; Type: SAM; Serial: TP-1534

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Left Cheek Middle/Area Scan (91x151x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 0.139 W/kg

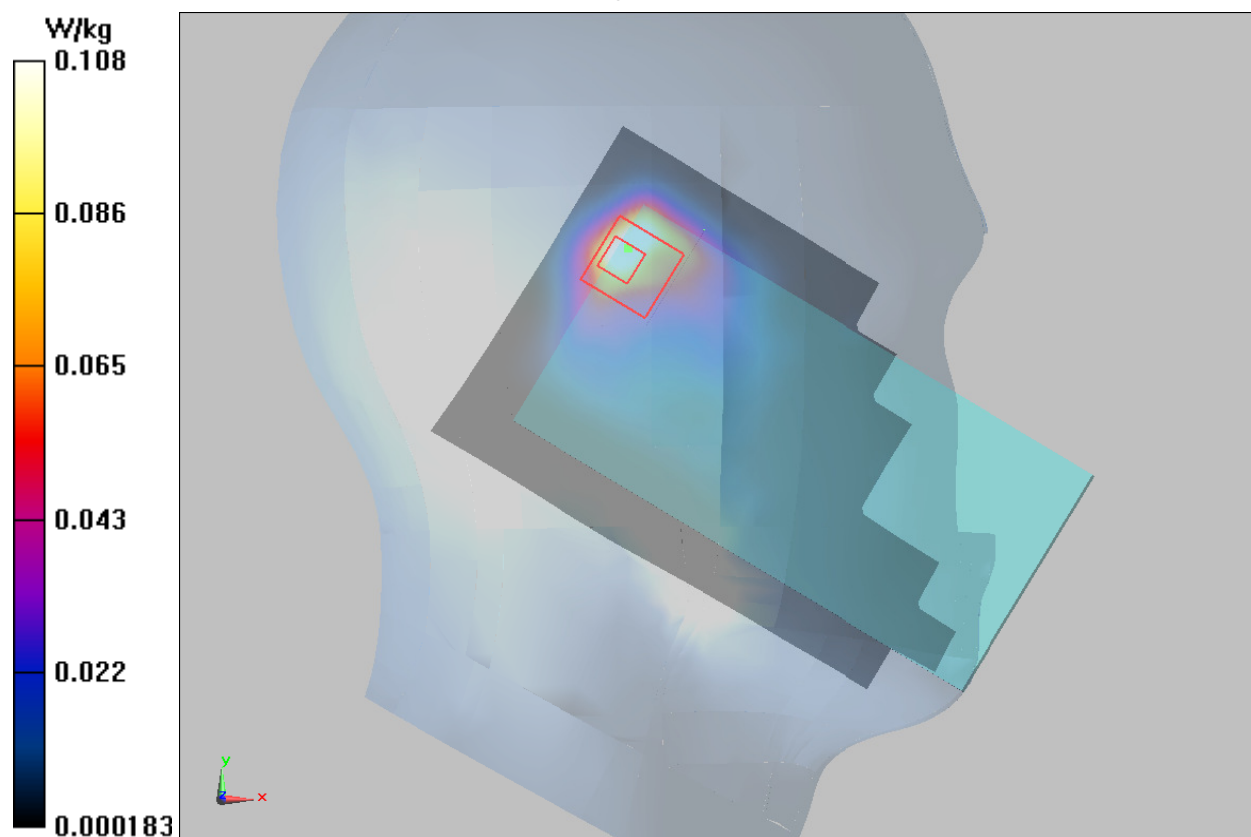
Left Cheek Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 4.232 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 0.234 W/kg

SAR(1 g) = 0.097 W/kg; SAR(10 g) = 0.044 W/kg

Maximum value of SAR (measured) = 0.108 W/kg



ANNEX D: Probe Calibration Certificate

**Calibration Laboratory of
Schmid & Partner
Engineering AG**
Zeughausstrasse 43, 8004 Zurich, Switzerland



S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **Auden**

Certificate No: **EX3-3898_Jun17**

CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3898**

Calibration procedure(s) **QA CAL-01.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6
Calibration procedure for dosimetric E-field probes**

Calibration date: **June 27, 2017**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02525)	Apr-18
Reference 20 dB Attenuator	SN: S5277 (20x)	07-Apr-17 (No. 217-02528)	Apr-18
Reference Probe ES3DV2	SN: 3013	31-Dec-16 (No. ES3-3013_Dec16)	Dec-17
DAE4	SN: 660	7-Dec-16 (No. DAE4-660_Dec16)	Dec-17
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-16)	In house check: Jun-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-16)	In house check: Oct-17

Calibrated by:	Name Leif Klynsner	Function Laboratory Technician	Signature
Approved by:	Name Katja Pokovic	Function Technical Manager	Signature

Issued: June 28, 2017

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: EX3-3898_Jun17

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